09/03/2026

Mr. Richard Saut
U. S. Steel Seamless Tubular Operations, LLC - Lorain
2199 E. 28th Street
Lorain, OH 44055

No	TOXIC REVIEW
No	PSD
No	SYNTHETIC MINOR TO AVOID MAJOR NSR
No	CEMS
No	MACT/GACT
No	NSPS
No	NESHAPS
No	NETTING
No	MAJOR NON-ATTAINMENT
No	MODELING SUBMITTED
No	MAJOR GHG
No	SYNTHETIC MINOR TO AVOID MAJOR GHG

RE: DRAFT AIR POLLUTION PERMIT-TO-INSTALL

Facility ID: 0247080961
Permit Number: P0141328
Permit Type: Administrative Modification
County: Lorain

Dear Permit Holder:

A draft of the Ohio Administrative Code (OAC) Chapter 3745-31 Air Pollution Permit-to-Install for the referenced facility has been issued for the emissions unit(s) listed in the Authorization section of the enclosed draft permit. This draft action is not an authorization to begin construction or modification of your emissions unit(s). The purpose of this draft is to solicit public comments on the permit. A public notice will appear in the Ohio Environmental Protection Agency (Ohio EPA) ***Weekly Review and Public Notices*** website. A copy of the public notice and the draft permit are enclosed. This permit can be accessed electronically on the Ohio EPA document search webpage: ***eDocument Search***. Comments will be accepted as a marked-up copy of the draft permit or in narrative format. Any comments must be sent to the following:

Andrea Moore
Permitting Section
Ohio EPA, DAPC
50 West Town Street, Suite 700
P.O. Box 1049
Columbus, Ohio 43216-1049

and

Ohio EPA DAPC, Northeast District Office
2110 East Aurora Rd.
Twinsburg, OH 44087

Comments and/or a request for a public hearing will be accepted within 30 days of the date the notice is published on the Ohio EPA ***Weekly Review and Public Notices*** website. You will be notified in writing if a public hearing is scheduled. A decision on issuing a final permit-to-install will be made after consideration of comments received and oral testimony if a public hearing is conducted. Any permit fee that will be due upon issuance of a final Permit-to-Install is indicated in the Authorization section. Please do not submit any payment now. If you have any questions, please contact Ohio EPA DAPC, Northeast District Office at (330)963-1200.

Sincerely,

Robert Hodanbosi

Robert Hodanbosi
Chief, Division of Air Pollution Control

cc: U.S. EPA Region 5 - *Via E-Mail Notification*
Ohio EPA-NEDO; Canada

PUBLIC NOTICE

The following matters are the subject of this public notice by the Ohio Environmental Protection Agency. The complete public notice, including any additional instructions for submitting comments, requesting information, a public hearing, or filing an appeal may be obtained at: ***Weekly Review and Public Notices | Ohio Environmental Protection Agency*** or Hearing Clerk, Ohio EPA, 50 W. Town St., Columbus, Ohio 43215. Ph: 614-644-3037 email: ***HClerk@epa.ohio.gov***

Draft Air Pollution Permit-to-Install Administrative Modification

U. S. Steel Seamless Tubular Operations, LLC - Lorain
2199 E. 28th Street
Lorain, OH 44055

ID#: P0141328
Date of Action: 09/03/2026
Permit Desc: Facility-initiated administrative modification to incorporate RACT standards. Pursuant to Part D of Title I of the Clean Air Act (CAA), Ohio EPA is required to establish a State Implementation Plan (SIP) for the attainment and maintenance of the NAAQS. The above-mentioned permit is a part of Ohio's SIP for attainment and maintenance of the 2015 ozone NAAQS and will be submitted to United States Environmental Protection Agency (U.S. EPA) as a modification of the SIP. The permit and complete instructions for requesting information or submitting comments may be obtained at: https://ohioepa.commentinput.com - Search by entering the permit #P0141328 in the "Search Projects" search box. The permit can be accessed electronically and comments may be submitted at: https://ohioepa.commentinput.com - Search by entering the permit P0141328 in the "Search Projects" search box. The public comment period will run until 10/05/2026 at 11:59 PM.

Permit Strategy Write-Up

1. Check all that apply:

   ☐ Synthetic Minor Determination **N/A**

   ☐ Netting Determination **N/A**

2. Source Description:

   Emissions units P002 – No. 3 Seamless Q & T Austenitizing Furnace, P036 – No. 3 Seamless Mill No. 1 Reheat Furnace, P049 – Small OD Product Austenitizing Furnace and P050 – Small OD Product Tempering Furnace. As required by the reclassification to serious nonattainment for ozone under the 2015 ozone National Ambient Air Quality Standards (NAAQS) promulgated by U.S. EPA, this facility has submitted a NO_x Reasonably Available Control Technology (RACT) study on April 22, 2026 (subsequently revised on May 18, 2026) to address the feasibility of controlling NO_x emissions from their steel reheat furnaces. These emissions units do not have any prior source-specific NO_x RACT established under OAC rule 3745-110-03. This permit modification includes the implementation of the proposed RACT limits in the May 2026 revision of the RACT study. Section C of this permit cites the RACT limits under OAC rule 3745-110-03(J), and the applicable rules table implements this under an OAC rule 3745-31-05(D) synthetic minor restriction for the affected unit.

   Pursuant to Part D of Title I of the Clean Air Act (CAA), Ohio EPA is required to establish a State Implementation Plan (SIP) for the attainment and maintenance of the NAAQS. This permit is part of Ohio's SIP for attainment and maintenance of the 2015 ozone NAAQS and will be submitted to United States Environmental Protection Agency (U.S. EPA) as a modification of the SIP.

3. Facility Emissions and Attainment Status:

   This is a Title V facility. Lorain County was designated as "serious" nonattainment for the 2015 ozone NAAQS but is now a maintenance county. The county is currently designated attainment for all NAAQS (criteria) pollutants which include ozone, PM2.5, PM10, CO, NO2, lead and SO2.

4. Source Emissions:

   Emissions units P002, P049 and P050 have NO_x emissions that are subject to the NO_x RACT requirements. The NO_x RACT determination for these emissions units are operation of low-NO_x burners (LNBs). These units were screened out of further RACT evaluation, and no additional analysis of alternative or add-on NO_x control technologies is warranted. Since P036 still uses conventional burners, a top-down NO_x RACT analysis was conducted. Based on the evaluation of available control technologies, no add-on or additional combustion-based control options were determined to be both technically feasible and economically reasonable for emission unit P036, including LNBs. Therefore, the study proposed that the existing NO_x limits were adequate.

5. Conclusion:

   The permit modification establishes NO_x RACT limits as proposed by Lorain County Facilities in their NO_x RACT study as part of the requirements for the 2015 ozone NAAQs nonattainment and maintenance areas under the reclassification to serious nonattainment for the Cleveland area. The NO_x RACT limits established in this permit are to be implemented within the timeline specified by the permit terms.

6. Please provide additional notes or comments as necessary:

   None

7. Total Permit Allowable Emissions Summary (for informational purposes only):

Pollutant	Tons Per Year
NO_x	69.81

DRAFT

Division of Air Pollution Control
Permit-to-Install
for
U. S. Steel Seamless Tubular Operations, LLC - Lorain

Facility ID:	0247080961
Permit Number:	P0141328
Permit Type:	Administrative Modification
Issued:	09/03/2026
Effective:	To be entered upon final issuance

Division of Air Pollution Control

Permit-to-Install

for

U. S. Steel Seamless Tubular Operations, LLC - Lorain

Table of Contents

Authorization

Facility ID:	0247080961
Facility Description:	Steel plant
Application Number(s):	M0008897, A0082553, M0008898
Permit Number:	P0141328
Permit Type:	Permit-To-Install
Permit Fee:	$0.00 *DO NOT send payment at this time, subject to change before final issuance*
Issue Date:	09/03/2026
Effective Date:	To be entered upon final issuance

This document constitutes issuance of a Permit-to-Install for the emissions unit(s) identified on the following page to:

U. S. Steel Seamless Tubular Operations, LLC - Lorain
2199 E. 28th Street
Lorain, OH 44055

Ohio Environmental Protection Agency (EPA) District Office or local air agency responsible for processing and administering your permit:

Ohio EPA DAPC, Northeast District Office
2110 East Aurora Rd.
Twinsburg, OH 44087
(330)963-1200

The above-named entity is hereby granted this Permit-to-Install for the air contaminant source(s) (emissions unit(s)) listed in this section pursuant to Chapter 3745-31 of the Ohio Administrative Code. Issuance of this permit does not constitute expressed or implied approval or agreement that, if constructed or modified in accordance with the plans included in the application, the described emissions unit(s) will operate in compliance with applicable State and Federal laws and regulations and does not constitute expressed or implied assurance that if constructed or modified in accordance with those plans and specifications, the above described emissions unit(s) of pollutants will be granted the necessary permits to operate (air) or NPDES permits as applicable.

This permit is granted subject to the conditions attached hereto.

Ohio Environmental Protection Agency

John Logue

Director

Authorization (continued)

Permit Number:P0141328

Permit Description:Facility-initiated administrative modification to incorporate RACT standards. Pursuant to Part D of Title I of the Clean Air Act (CAA), Ohio EPA is required to establish a State Implementation Plan (SIP) for the attainment and maintenance of the NAAQS. The above-mentioned permit is a part of Ohio's SIP for attainment and maintenance of the 2015 ozone NAAQS and will be submitted to United States Environmental Protection Agency (U.S. EPA) as a modification of the SIP. The permit and complete instructions for requesting information or submitting comments may be obtained at: https://ohioepa.commentinput.com - Search by entering the permit #P0141328 in the "Search Projects" search box.

Permits for the following Emissions Unit(s) or groups of Emissions Units are in this document as indicated below:

Emissions Unit ID:	P002
Company Equipment ID:	No. 3 Smls Q & T Austenitizing Furnace
Superseded Permit Number:	02-15543
General Permit Category and Type:	Not Applicable
Emissions Unit ID:	P036
Company Equipment ID:	No. 3 Seamless Mill No. 1 Reheat Furnace
Superseded Permit Number:	
General Permit Category and Type:	Not Applicable
Emissions Unit ID:	P049
Company Equipment ID:	Small OD Product Austentizing Furnace
Superseded Permit Number:	P0106201
General Permit Category and Type:	Not Applicable
Emissions Unit ID:	P050
Company Equipment ID:	Small OD Product Tempering Furnace
Superseded Permit Number:	P0106201
General Permit Category and Type:	Not Applicable

List of Commonly Used Abbreviations

AP-42 = U.S. EPA's Compilation of Air Pollution Emissions Factors	HVLP = high volume, low pressure	PER = Permit Evaluation Report
ASTM = American Society for Testing and Materials	LAER = lowest achievable emission rate	PM = particulate matter
BACT = Best Available Control Technology	lb(s)/hr = pound(s) per hour	PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns
BAT = Best Available Technology	LDAR = leak detection and repair	$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
CAA = Clean Air Act	LPG = liquefied petroleum gas/propane	ppb = parts per billion
CAM = compliance assurance monitoring	MACT = maximum achievable control technology	ppm = parts per million
CEMS = continuous emissions monitoring system	MAGLC = maximum acceptable ground level concentration	PSD = Prevention of Significant Deterioration
CFC = chlorofluorocarbon	mg/m3 = milligrams per cubic meter	psi = pounds per square inch
CFR = Code of Federal Regulations	MM = million	psia = pounds per square inch absolute
CH_4 = methane	MMBtu = million British Thermal Units	PTE = potential-to-emit
CI = compression ignition	MSDS = material safety data sheet	PTI = Permit-to-Install
CO = carbon monoxide	MSW = municipal solid waste	PTIO = Permit-to-Install and Operate
CO_2 = carbon dioxide	NAAQS = National Ambient Air Quality Standard	PTO = Permit-to-Operate
COM = continuous opacity monitor	NESHAP = National Emission Standard for Hazardous Air Pollutants	PWR = process weight rate
DAPC = Division of Air Pollution Control	NG = natural gas	RACM = reasonably available control measures
DO/LAA = District Office/Local Air Agency	ng/m3 = nanograms per cubic meter	RACT = reasonably available control technology
dscf = dry standard cubic foot	NH_3 = ammonia	RATA = relative accuracy test audit
EAC = emissions activity category	NMHC = non-methane hydrocarbons	RTO = regenerative thermal oxidizer
eDocs = electronic documents database	NMOC = non-methane organic compound	SB265 = Senate Bill 265
ERAC = Environmental Review Appeals Commission	NO = nitrogen oxide	scfm = standard cubic feet per minute
ESP = electrostatic precipitator	NO_2 = nitrogen dioxide	SI = spark ignition
EU = emissions unit	NO_x = nitrogen oxides	SIP = State Implementation Plan
FEPTIO = Federally Enforceable Permit-to-Install and Operate	NSPS = New Source Performance Standard	SO_2 = sulfur dioxide
FER = Fee Emissions Report	NSR = New Source Review	SSMP = startup, shutdown, and malfunction plan
FR = Federal Register	NTV = Non-Title V	TDS = total dissolved solids
GACT = generally achievable control technology	O&M = operation and maintenance	TLV = threshold limit value
GHG = greenhouse gases	OAC = Ohio Administrative Code	TO = thermal oxidizer
gr/dscf = grains per dry standard cubic foot	OC = organic compound	TPH = ton(s) per hour
H_2S = hydrogen sulfide	Ohio EPA = Ohio Environmental Protection Agency	TPY = ton(s) per year
H_2SO_4 = sulfuric acid	ORC = Ohio Revised Code	TSP = total suspended particulates
HAP = hazardous air pollutant	Pb = lead	VE = visible particulate emissions
HCl = hydrogen chloride	PBR = Permit-By-Rule	VMT = vehicle miles traveled
HF = hydrogen fluoride	PCB = polychlorinated biphenyl	VOC = volatile organic compound
Hg = mercury	PE = particulate emissions	WPP = work practice plan
hp = horsepower	PEMS = predictive emissions monitoring system	µg/m3 = micrograms per cubic meter

A. Standard Terms and Conditions

1. Federally Enforceable Standard Terms and Conditions

a) All Standard Terms and Conditions are federally enforceable, with the exception of those listed below which are enforceable under state law only:

(1) Standard Term and Condition A.2.a), Severability Clause

(2) Standard Term and Condition A.3.c) through A. 3.e), General Requirements

(3) Standard Term and Condition A.6.c), Compliance Requirements

(4) Standard Term and Condition A.9., Reporting Requirements

(5) Standard Term and Condition A.10., Applicability

(6) Standard Term and Condition A.11.b) through A.11.e), Construction of New Source(s) and Authorization to Install

(7) Standard Term and Condition A.14., Public Disclosure

(8) Standard Term and Condition A.15., Additional Reporting Requirements When There Are No Deviations of Federally Enforceable Emission Limitations, Operational Restrictions, or Control Device Operating Parameter Limitations

(9) Standard Term and Condition A.16., Fees

(10) Standard Term and Condition A.17., Permit Transfers

2. Severability Clause

a) A determination that any term or condition of this permit is invalid shall not invalidate the force or effect of any other term or condition thereof, except to the extent that any other term or condition depends in whole or in part for its operation or implementation upon the term or condition declared invalid.

b) All terms and conditions designated in parts B. and C. of this permit are federally enforceable as a practical matter, if they are required under the Act, or any of its applicable requirements, including relevant provisions designed to limit the potential to emit of a source, are enforceable by the Administrator of the U.S. EPA and the state and by citizens (to the extent allowed by section 304 of the Act) under the Act. Terms and conditions in parts B and C of this permit shall not be federally enforceable and shall be enforceable under state law only, only if specifically identified in this permit as such.

3. General Requirements

a) Any noncompliance with the federally enforceable terms and conditions of this permit constitutes a violation of the Act and is grounds for enforcement action or for permit revocation, revocation and re-issuance, or modification.

b) It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the federally enforceable terms and conditions of this permit.

c) This permit may be modified, revoked, or revoked and reissued, for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or revocation, or of a notification of planned changes or anticipated noncompliance does not stay any term and condition of this permit.

d) This permit does not convey any property rights of any sort, or any exclusive privilege.

e) The permittee shall furnish to the Director of the Ohio EPA, or an authorized representative of the Director, upon receipt of a written request and within a reasonable time, any information that may be requested to determine whether cause exists for modifying or revoking this permit or to determine compliance with this permit. Upon request, the permittee shall also furnish to the Director or an authorized representative of the Director, copies of records required to be kept by this permit. For information claimed to be confidential in the submittal to the Director, if the Administrator of the U.S. EPA requests such information, the permittee may furnish such records directly to the Administrator along with a claim of confidentiality.

4. Monitoring and Related Record Keeping and Reporting Requirements

a) Except as may otherwise be provided in the terms and conditions for a specific emissions unit, the permittee shall maintain records that include the following, where applicable, for any required monitoring under this permit:

(1) The date, place (as defined in the permit), and time of sampling or measurements.

(2) The date(s) analyses were performed.

(3) The company or entity that performed the analyses.

(4) The analytical techniques or methods used.

(5) The results of such analyses.

(6) The operating conditions existing at the time of sampling or measurement.

b) Each record of any monitoring data, testing data, and support information required pursuant to this permit shall be retained for a period of five years from the date the record was created. Support information shall include, but not be limited to, all calibration and maintenance records and all original strip-chart recordings for continuous monitoring instrumentation, and copies of all reports required by this permit. Such records may be maintained in computerized form.

c) Except as may otherwise be provided in the terms and conditions for a specific emissions unit, the permittee shall submit required reports in the following manner:

(1) Reports of any required monitoring and/or recordkeeping of federally enforceable information shall be submitted to the Ohio EPA DAPC, Northeast District Office.

(2) Quarterly written reports of (i) any deviations from federally enforceable emission limitations, operational restrictions, and control device operating parameter limitations, excluding deviations resulting from malfunctions reported in accordance with OAC rule 3745-15-06, that have been detected by the testing, monitoring and recordkeeping requirements specified in this permit, (ii) the probable cause of such deviations, and (iii) any corrective actions or preventive measures taken, shall be made to the Ohio EPA DAPC, Northeast District Office. The written reports shall be submitted quarterly, by January 31, April 30, July 31, and October 31 of each year and shall cover the previous calendar quarters. See A.15. below if no deviations occurred during the quarter.

(3) Written reports, which identify any deviations from the federally enforceable monitoring, recordkeeping, and reporting requirements contained in this permit shall be submitted to the Ohio EPA DAPC, Northeast District Office every six months, by January 31 and July 31 of each year for the previous six calendar months. If no deviations occurred during a six-month period, the permittee shall submit a semiannual report, which states that no deviations occurred during that period.

(4) This permit is for an emissions unit located at a Title V facility. Each written report shall be signed by a responsible official certifying that, based on information and belief formed after reasonable inquiry, the statements and information in the report are true, accurate, and complete.

d) The permittee shall report actual emissions pursuant to OAC Chapter 3745-78 for the purpose of collecting Air Pollution Control Fees.

5. Scheduled Maintenance/Malfunction Reporting

Any scheduled maintenance of air pollution control equipment shall be performed in accordance with paragraph (A) of OAC rule 3745-15-06. The malfunction, i.e., upset, of any emissions units or any associated air pollution control system(s) shall be reported to the Ohio EPA DAPC, Northeast District Office in accordance with paragraph (B) of OAC rule 3745-15-06. (The definition of an upset condition shall be the same as that used in OAC rule 3745-15-06(B)(1) for a malfunction.) The verbal and written reports shall be submitted pursuant to OAC rule 3745-15-06.

Except as provided in that rule, any scheduled maintenance or malfunction necessitating the shutdown or bypassing of any air pollution control system(s) shall be accompanied by the shutdown of the emission unit(s) that is (are) served by such control system(s).

6. Compliance Requirements

a) All applications, notifications or reports required by terms and conditions in this permit to be submitted or "reported in writing" are to be submitted to Ohio EPA through the Ohio EPA's eBusiness Center: Air Services web service ("Air Services"). Ohio EPA will accept hard copy submittals on an as-needed basis if the permittee cannot submit the required documents through the Ohio EPA eBusiness Center. In the event of an alternative hard copy submission in lieu of the eBusiness Center, the post-marked date or the date the document is delivered in person will be recognized as the date submitted. Electronic submission of applications, notifications or reports required to be submitted to Ohio EPA fulfills the requirement to submit the required information to the Director, the appropriate Ohio EPA District Office or contracted local air agency, and/or any other individual or organization specifically identified as an additional recipient identified in this permit unless otherwise specified. Consistent with OAC rule 3745-15-03, the electronic signature date shall constitute the date that the required application, notification or report is considered to be "submitted". Any document requiring signature may be represented by entry of the personal identification number (PIN) by responsible official as part of the electronic submission process or by the scanned attestation document signed by the Authorized Representative that is attached to the electronically submitted written report.

Any document (including reports) required to be submitted and required by a federally applicable requirement in this permit shall include a certification by a Responsible Official that, based on information and belief formed after reasonable inquiry, the statements in the document are true, accurate, and complete

b) Upon presentation of credentials and other documents as may be required by law, the permittee shall allow the Director of the Ohio EPA or an authorized representative of the Director to:

(1) At reasonable times, enter upon the permittee's premises where a source is located, or the emissions-related activity is conducted, or where records must be kept under the conditions of this permit.

(2) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit, subject to the protection from disclosure to the public of confidential information consistent with ORC section 3704.08.

(3) Inspect at reasonable times any facilities, equipment (including monitoring and air pollution control equipment), practices, or operations regulated or required under this permit.

(4) As authorized by the Act, sample or monitor at reasonable times substances or parameters for the purpose of assuring compliance with the permit and applicable requirements.

c) The permittee shall submit progress reports to the Ohio EPA DAPC, Northeast District Office concerning any schedule of compliance for meeting an applicable requirement. Progress reports shall be submitted semiannually or more frequently if specified in the applicable requirement or by the Director of the Ohio EPA. Progress reports shall contain the following:

(1) Dates for achieving the activities, milestones, or compliance required in any schedule of compliance, and dates when such activities, milestones, or compliance were achieved.

(2) An explanation of why any dates in any schedule of compliance were not or will not be met, and any preventive or corrective measures adopted.

7. Best Available Technology

As specified in OAC Rule 3745-31-05, new sources that must employ Best Available Technology (BAT) shall comply with the Applicable Emission Limitations/Control Measures identified as BAT for each subject emissions unit.

8. Air Pollution Nuisance

The air contaminants emitted by the emissions units covered by this permit shall not cause a public nuisance, in violation of OAC rule 3745-15-07.

9. Reporting Requirements

The permittee shall submit required reports in the following manner:

a) Reports of any required monitoring and/or recordkeeping of state-only enforceable information shall be submitted to the Ohio EPA DAPC, Northeast District Office.

b) Except as otherwise may be provided in the terms and conditions for a specific emissions unit, quarterly written reports of (a) any deviations (excursions) from state-only required emission limitations, operational restrictions, and control device operating parameter limitations that have been detected by the testing, monitoring, and recordkeeping requirements specified in this permit, (b) the probable cause of such deviations, and (c) any corrective actions or preventive measures which have been or will be taken, shall be submitted to the Ohio EPA DAPC, Northeast District Office. If no deviations occurred during a calendar quarter, the permittee shall submit a quarterly report, which states that no deviations occurred during that quarter. The reports shall be submitted quarterly, by January 31, April 30, July 31, and October 31 of each year and shall cover the previous calendar quarters. (These quarterly reports shall exclude deviations resulting from malfunctions reported in accordance with OAC rule 3745-15-06.)

10. Applicability

This permit-to-install is applicable only to the emissions unit(s) identified in the permit-to-install. Separate application must be made to the Director for the installation or modification of any other emissions unit(s) not exempt from the requirement to obtain a permit-to-install.

11. Construction of New Sources(s) and Authorization to Install

a) This permit does not constitute an assurance that the proposed source will operate in compliance with all Ohio laws and regulations. This permit does not constitute expressed or implied assurance that the proposed facility has been constructed in accordance with the application and terms and conditions of this permit. The action of beginning and/or completing construction prior to obtaining the Director's approval constitutes a violation of OAC rule 3745-31-02. Furthermore, issuance of this permit does not constitute an assurance that the proposed source will operate in compliance with all Ohio laws and regulations. Issuance of this permit is not to be construed as a waiver of any rights that the Ohio Environmental Protection Agency (or other persons) may have against the applicant for starting construction prior to the effective date of the permit. Additional facilities shall be installed upon orders of the Ohio Environmental Protection Agency if the proposed facilities cannot meet the requirements of this permit or cannot meet applicable standards.

b) If applicable, authorization to install any new emissions unit included in this permit shall terminate within eighteen months of the effective date of the permit if the owner or operator has not undertaken a continuing program of installation or has not entered into a binding contractual obligation to undertake and complete within a reasonable time a continuing program of installation. This deadline may be extended once by twelve months if application is made to the Director within a reasonable time before the termination date and the permittee shows good cause for any such extension.

c) The permittee may notify Ohio EPA of any emissions unit that is permanently shut down (i.e., the emissions unit has been physically removed from service or has been altered in such a way that it can no longer operate without a subsequent "modification" or "installation" as defined in OAC Chapter 3745-31) by submitting a certification from the authorized official that identifies the date on which the emissions unit was permanently shut down. Authorization to operate the affected emissions unit shall cease upon the date certified by the authorized official that the emissions unit was permanently shut down. At a minimum, notification of permanent shut down shall be made or confirmed by marking the affected emissions unit(s) as "permanently shut down" in "Air Services" along with the date the emissions unit(s) was permanently removed and/or disabled. Submitting the facility profile update electronically will constitute notifying the Director of the permanent shutdown of the affected emissions unit(s).

d) The provisions of this permit shall cease to be enforceable for each affected emissions unit after the date on which an emissions unit is permanently shut down (i.e., emissions unit has been physically removed from service or has been altered in such a way that it can no longer operate without a subsequent "modification" or "installation" as defined in OAC Chapter 3745-31). All records relating to any permanently shut down emissions unit, generated while the emissions unit was in operation, must be maintained in accordance with law. All reports required by this permit must be submitted for any period an affected emissions unit operated prior to permanent shut down. At a minimum, the permit requirements must be evaluated as part of the reporting requirements identified in this permit covering the last period the emissions unit operated.

Unless otherwise exempted, no emissions unit certified by the responsible official as being permanently shut down may resume operation without first applying for and obtaining a permit pursuant to OAC Chapter 3745-31 and OAC Chapter 3745-77 if the restarted operation is subject to one or more applicable requirements.

e) The permittee shall comply with any residual requirements related to this permit, such as the requirement to submit a deviation report, air fee emission report, or any other reporting required by this permit for the period the operating provisions of this permit were enforceable, or as required by regulation or law. All reports shall be submitted in a form and manner prescribed by the Director. All records relating to this permit must be maintained in accordance with law.

12. Permit-To-Operate Application

The permittee is required to apply for a Title V permit pursuant to OAC Chapter 3745-77. The permittee shall submit a complete Title V permit application or a complete Title V permit modification application within twelve months after commencing operation of the emissions units covered by this permit. However, if operation of the proposed new or modified source(s) as authorized by this permit would be prohibited by the terms and conditions of an existing Title V permit, a Title V permit modification of such new or modified source(s) pursuant to OAC rule 3745-77-04(D) and OAC rule 3745-77-08(C)(3)(d) must be obtained before operating the source in a manner that would violate the existing Title V permit requirements.

13. Construction Compliance Certification

The applicant shall identify the following dates in the "Air Services" facility profile for each new emissions unit identified in this permit.

a) Completion of initial installation date shall be entered upon completion of construction and prior to start-up.

b) Commence operation after installation or latest modification date shall be entered within 90 days after commencing operation of the applicable emissions unit.

14. Public Disclosure

The facility is hereby notified that this permit, and all agency records concerning the operation of this permitted source, are subject to public disclosure in accordance with OAC rule 3745-49-03.

15. Additional Reporting Requirements When There Are No Deviations of Federally Enforceable Emission Limitations, Operational Restrictions, or Control Device Operating Parameter Limitations

If no deviations occurred during a calendar quarter, the permittee shall submit a quarterly report, which states that no deviations occurred during that quarter. The reports shall be submitted quarterly by January 31, April 30, July 31, and October 31 of each year and shall cover the previous calendar quarters.

16. Fees

The permittee shall pay fees to the Director of the Ohio EPA in accordance with ORC section 3745.11 and OAC Chapter 3745-78. The permittee shall pay all applicable permit-to-install fees within 30 days after the issuance of any permit-to-install. The permittee shall pay all applicable permit-to-operate fees within thirty days of the issuance of the invoice.

17. Permit Transfers

Any transferee of this permit shall assume the responsibilities of the prior permit holder. The new owner must update and submit the ownership information via the "Owner/Contact Change" functionality in "Air Services" once the transfer is legally completed. The change must be submitted through "Air Services" within thirty days of the ownership transfer date.

18. Risk Management Plans

If the permittee is required to develop and register a risk management plan pursuant to section 112(r) of the Clean Air Act, as amended, 42 U.S.C. 7401 et seq. ("Act"), the permittee shall comply with the requirement to register such a plan.

19. Title IV Provisions

If the permittee is subject to the requirements of 40 CFR Part 72 concerning acid rain, the permittee shall ensure that any affected emissions unit complies with those requirements. Emissions exceeding any allowances that are lawfully held under Title IV of the Act, or any regulations adopted thereunder, are prohibited.

B. Facility Wide Terms and Conditions

1. All the following facility-wide terms and conditions are federally enforceable with the exception of those listed below which are enforceable under state law only.

    a) None.

C. Emissions Unit Terms and Conditions

1. P002, No. 3 Smls Q & T Austenitizing Furnace

Operations, Property and/or Equipment Description:

Quench and Temper heat-treat line Austenitizing Furnace

a) The following EU terms and conditions are federally enforceable with the exception of those listed below which are enforceable under state law only.

(1) None.

b) Applicable Emissions Limitations and/or Control Requirements

(1) The specific operation(s), property, and/or equipment that constitute each EU along with the applicable rules and/or requirements and with the applicable emissions limitations and/or control measures are identified below. Emissions from each unit shall not exceed the listed limitations, and the listed control measures shall be specified in narrative form following the table.

	Applicable Rules/Requirements	Applicable Emissions Limitations/Control Measures
a.	OAC rule 3745-31-05(A)(3)	NO_x emissions shall not exceed 0.072 lb/MMBtu of actual heat input (as measured at the maximum firing condition). NO_x emissions shall not exceed 3.6 lbs/hr and 15.8 TPY. CO emissions shall not exceed 4.2 lbs/hr and 18.4 TPY. PE shall not exceed 0.10 lb/hr and 0.42 TPY. SO_2 emissions shall not exceed 0.03 lb/hr and 0.13 TPY. OC emissions shall not exceed 0.55 lb/hr and 2.41 TPY. VE shall not exceed 5% opacity, as a 6-minute average.
b.	OAC rule 3745-17-11(B)	See b)(2)a.
c.	OAC rule 3745-17-07(A)	See b)(2)a.
d.	OAC rule 3745-18-53(D)(4)	See b)(2)a. and g)(1).
e.	OAC rule 3745-31-05(D) [Federally Enforceable Requirements to Comply with OAC rule 3745-110-03(J)]	See b)(2)b.

	Applicable Rules/Requirements	Applicable Emissions Limitations/Control Measures
f.	OAC rule 3745-110-03(J)	The NO_x RACT determination in accordance with this rule is equivalent to the lb NO_x/MMBtu emission limit established pursuant to OAC rule 3745-31-05(D).

(2) Additional Terms and Conditions

a. The emission limitation required by this applicable rule is less stringent than the emission limitation established pursuant to OAC rule 3745-31-05(A)(3).

b. As required by the reclassification to serious nonattainment for ozone under the 2015 ozone NAAQS promulgated by U.S. EPA, and pursuant to OAC rule 3745-110-03(J) and the NOx Reasonably Available Control Technology (RACT) Study submitted by U.S. Steel on April 22, 2026 (subsequently revised on May 18, 2026): compliance with the NOx emissions limitations established pursuant to OAC rule 3745-31-05(A)(3) are equivalent to NOx RACT. NOx emissions shall not exceed 0.072 lb/MMBtu of actual heat input (as measured at the maximum firing condition) and shall not exceed 3.6 lbs/hr and 15.8 TPY.

c) Operational Restrictions

(1) The permittee shall burn only NG in this EU.

d) Monitoring and/or Recordkeeping Requirements

(1) For each day during which the permittee burns a fuel other than NG the permittee shall maintain a record of the type and quantity of fuel burned in this EU.

e) Reporting Requirements

(1) The permittee shall submit deviation (excursion) reports that identify each day when a fuel other than NG was burned in this EU. Each report shall be submitted within 30 days after the deviation occurs.

f) Testing Requirements

(1) Compliance with the Emissions Limitations and/or Control Requirements specified in section b) of these terms and conditions shall be determined in accordance with the following methods:

a. Emission Limitations:

NO_x emissions shall not exceed 0.072 lb/MMBtu of actual heat input (as measured at the maximum firing condition).

NO_x emissions shall not exceed 3.6 lbs/hr and 15.8 TPY.

Applicable Compliance Methods:

Compliance with the NO_x emission limitation has been demonstrated based upon previous emission testing conducted on this EU. If required, compliance shall be demonstrated based upon additional emission testing performed in accordance with the methods and procedures specified in 40 CFR Part 60, Appendix A, Methods 1 through 4 and Method 7, 7E or other USEPA-approved test methods, with prior approval from the Ohio EPA.

The TPY emission limitation was developed by multiplying the short-term allowable NO_x emission limitation (3.6 lbs/hr) by the maximum annual hours of operation (8,760 hours) and then dividing by 2,000 lbs per ton. Therefore, if compliance is shown with the short-term allowable emission limitation, compliance is demonstrated with the annual emission limitation.

b. Emission Limitations:

CO emissions shall not exceed 4.2 lbs/hr and 18.4 TPY.

Applicable Compliance Methods:

The permittee may demonstrate compliance with the hourly CO emission limitation by multiplying the maximum hourly NG consumption rate (MMcf/hr) by 84 lbs/MMcf (from AP-42, Table 1.4-1, 7/98 version).

If required, the permittee shall demonstrate compliance with the hourly CO emission limitation through emission testing performed in accordance with the methods and procedures specified in 40 CFR Part 60, Appendix A, Methods 1 through 4 and Method 10 or other USEPA-approved test method with prior approval from the Ohio EPA.

The TPY emission limitation was developed by multiplying the short-term allowable CO emission limitation (4.2 lbs/hr) by the maximum annual hours of operation (8,760 hours) and then dividing by 2,000 lbs per ton. Therefore, if compliance is shown with the short-term allowable emission limitation, compliance is demonstrated with the annual emission limitation.

c. Emission Limitations:

PE shall not exceed 0.10 lb/hr and 0.42 TPY.

Applicable Compliance Method:

The permittee may demonstrate compliance with the hourly PE limitation by multiplying the maximum hourly NG consumption rate (MMcf/hr) by 1.9 lbs/MMcf (from AP-42, Table 1.4-2, 7/98 version).

If required, the permittee shall demonstrate compliance with the hourly PE limitation through emission testing performed in accordance with the methods and procedures specified in 40 CFR Part 60, Appendix A, Methods 1 through 5 or other USEPA-approved test methods, with prior approval from the Ohio EPA.

The TPY emission limitation was developed by multiplying the short-term allowable PE limitation (0.10 lb/hr) by the maximum annual hours of operation (8,760 hours) and then dividing by 2,000 lbs per ton. Therefore, if compliance is shown with the short-term allowable emission limitation, compliance is demonstrated with the annual emission limitation.

d. Emission Limitations:

SO_2 emissions shall not exceed 0.03 lb/hr and 0.13 TPY.

Applicable Compliance Methods:

The permittee may demonstrate compliance with the hourly SO_2 emission limitation by multiplying the maximum hourly NG consumption rate (MMcf/hr) by 0.6 lb/MMcf (from AP-42, Table 1.4-2, 7/98 version).

If required, the permittee shall demonstrate compliance with the hourly SO_2 emission limitation through emission testing performed in accordance with the methods and procedures specified in 40 CFR Part 60, Appendix A, Methods 1 through 4 and Method 6 and OAC rule 3745-18-04 or other USEPA-approved test methods, with prior approval from the Ohio EPA.

The TPY emission limitation was developed by multiplying the short-term allowable SO_2 emission limitation (0.03 lb/hr) by the maximum annual hours of operation (8,760 hours) and then dividing by 2,000 lbs per ton. Therefore, if compliance is shown with the short-term allowable emission limitation, compliance is demonstrated with the annual emission limitation.

e. Emission Limitations:

OC emissions shall not exceed 0.55 lb/hr and 2.41 TPY.

Applicable Compliance Methods:

The permittee may demonstrate compliance with the hourly OC emission limitation by multiplying the maximum hourly NG consumption rate ($MMft^3$/hr) by 11 lbs/ $MMft^3$ (from AP-42, Table 1.4-2, 7/98 version).

If required, the permittee shall demonstrate compliance with the hourly OC emission limitation through emission testing performed in accordance with the methods and procedures specified in 40 CFR Part 60, Appendix A, Methods 1 through 4 and Method 18, 25 or 25A, as appropriate. Use of Method 18, 25 or 25A is to be selected based on the results of pre-survey stack sampling and USEPA guidance documents. Alternative USEPA-approved test methods may be used with prior approval from Ohio EPA.

The TPY emission limitation was developed by multiplying the short-term allowable OC emission limitation (0.55 lb/hr) by the maximum annual hours of operation (8,760 hours) and then dividing by 2,000 lbs per ton. Therefore, if compliance is shown with the short-term allowable emission limitation, compliance is demonstrated with the annual emission limitation.

f. Emission Limitation:

VE shall not exceed 5% opacity, as a 6-minute average.

Applicable Compliance Method:

If required, compliance shall be demonstrated through VE observations performed in accordance with the methods and procedures specified in 40 CFR Part 60, Appendix A, Method 9 and OAC rule 3745-17-03(B)(1) or other US EPA-approved test methods, with prior approval from the Ohio EPA.

g) Miscellaneous Requirements

(1) This EU is subject to the requirements of OAC rule 3745-18-53(D) because “Republic Engineered Products, Inc." (Ohio EPA premise number 0247080229) split into two companies. US Steel owns and operates the tube mill side of this plant and operates furnaces subject to OAC 3745-18-53(D)(4). The rule specifies that it applies to "Republic Engineered Products, Inc." (Ohio EPA premise number 0247080229) or any subsequent owner or operator of the "Republic Engineered Products, Inc., 1807 East 28th Street, Lorain, Ohio".

2. P036, No. 3 Seamless Mill No. 1 Reheat Furnace

Operations, Property and/or Equipment Description:

30.8 MMBtu/hr NG Fired Reheat Furnace

a) The following EU terms and conditions are federally enforceable with the exception of those listed below which are enforceable under state law only.

(1) None.

b) Applicable Emissions Limitations and/or Control Requirements

(1) The specific operation(s), property, and/or equipment that constitute each EU along with the applicable rules and/or requirements and with the applicable emissions limitations and/or control measures are identified below. Emissions from each unit shall not exceed the listed limitations, and the listed control measures shall be specified in narrative form following the table.

	Applicable Rules/Requirements	Applicable Emissions Limitations/Control Measures
a.	OAC rule 3745-31-05(A)(3)	NO_x emissions shall not exceed 0.15 lb/MMBtu.
b.	OAC rule 3745-17-11(B)	See b)(2)a.
c.	OAC rule 3745-17-07(A)	See b)(2)b.
d.	OAC rule 3745-18-53(D)(4)	SO_2 emissions shall not exceed 1.98 lbs/MMBtu of actual heat input. See b)(2)c. and g)(1).
e.	OAC rule 3745-31-05(D) [Federally Enforceable Requirements to Comply with OAC rule 3745-110-03(J)]	See b)(2)d.
f.	OAC rule 3745-110-03(J)	The NOx RACT determination in accordance with this rule is equivalent to the lb NOx/MMBtu emission limit established pursuant to OAC rule 3745-31-05(D).

(2) Additional Terms and Conditions

a. The uncontrolled mass rate of PE from this EU is less than 10 lbs/hr. Therefore, pursuant to OAC rule 3745-17-11(A)(2)(a)(ii), Figure II of OAC rule 3745-17-11 does not apply. In addition, Table I of OAC rule 3745-17-11 does not apply because the process weight, as defined in OAC rule 3745-17-01(B)(14), is equal to zero.

b. This EU is exempt from the VE limitations specified in OAC rule 3745-17-07(A), pursuant to OAC rule 3745-17-07(A)(3)(h), because the EU is not subject to the requirements of OAC rule 3745-17-11.

c. The potential SO_2 emissions from this EU are negligible because the combustion of NG is the only source of these emissions (the combustion of NG produces negligible amounts of SO_2 emissions).

d. As required by the reclassification to serious nonattainment for ozone under the 2015 ozone NAAQS promulgated by U.S. EPA, and pursuant to OAC rule 3745-110-03(J) and the NOx Reasonably Available Control Technology (RACT) Study submitted by U.S. Steel on April 22, 2026 (subsequently revised on May 18, 2026): compliance with the NOx emissions limitations established pursuant to OAC rule 3745-31-05(A)(3) are equivalent to NOx RACT. NOx emissions shall not exceed 0.15 lb/MMBtu of actual heat input (as measured at the maximum firing condition).

c) Operational Restrictions

(1) The permittee shall burn only NG in this EU.

d) Monitoring and/or Recordkeeping Requirements

(1) For each day during which the permittee burns a fuel other than NG the permittee shall maintain a record of the type and quantity of fuel burned in this EU.

e) Reporting Requirements

(1) The permittee shall submit deviation (excursion) reports that identify each day when a fuel other than NG was burned in this EU. Each report shall be submitted within 30 days after the deviation occurs.

f) Testing Requirements

(1) Compliance with the Emissions Limitations and/or Control Requirements specified in section b) of these terms and conditions shall be determined in accordance with the following methods:

a. Emission Limitations:

NO_x emissions shall not exceed 0.15 lb/MMBtu.

Applicable Compliance Methods:

Compliance with the NO_x emission limitation has been demonstrated based upon previous emission testing conducted on this EU. If required, compliance shall be demonstrated based upon additional emission testing performed in accordance with the methods and procedures specified in 40 CFR Part 60, Appendix A, Methods 1 through 4 and Method 7, 7E or other USEPA-approved test methods, with prior approval from the Ohio EPA.

b. Emission Limitation:

SO_2 emissions shall not exceed 1.98 lbs/MMBtu of actual heat input.

Applicable Compliance Methods:

If required, the permittee shall demonstrate compliance with the SO_2 emission limitation through emission testing performed in accordance with the methods and procedures specified in 40 CFR Part 60, Appendix A, Methods 1 through 4 and Method 6 and OAC rule 3745-18-04, or other USEPA-approved test methods, with prior approval from the Ohio EPA.

g) Miscellaneous Requirements

(1) This EU is subject to the requirements of OAC rule 3745-18-53(D) because “Republic Engineered Products, Inc." (Ohio EPA premise number 0247080229) split into two companies. US Steel owns and operates the tube mill side of this plant and operates furnaces subject to OAC 3745-18-53(D)(4). The rule specifies that it applies to "Republic Engineered Products, Inc." (Ohio EPA premise number 0247080229) or any subsequent owner or operator of the "Republic Engineered Products, Inc., 1807 East 28th Street, Lorain, Ohio".

3. P049, Small OD Product Austenitizing Furnace

Operations, Property and/or Equipment Description:

34.0 MMBtu/hr heat input NG-fired heat treat furnace

a) The following EU terms and conditions are federally enforceable with the exception of those listed below which are enforceable under state law only.

(1) None.

b) Applicable Emissions Limitations and/or Control Requirements

(1) The specific operation(s), property, and/or equipment that constitute each EU along with the applicable rules and/or requirements and with the applicable emissions limitations and/or control measures are identified below. Emissions from each unit shall not exceed the listed limitations, and the listed control measures shall be specified in narrative form following the table.

	Applicable Rules/Requirements	Applicable Emissions Limitations/Control Measures
a.	OAC rule 3745-31-05(A)(3)	NO_x emissions shall not exceed 0.08 lb/MMBtu of actual heat input (as measured at the maximum firing condition). NO_x emissions shall not exceed 21.86 TPY. CO emissions shall not exceed 5.14 lbs/hr and 22.51 TPY.
b.	OAC rule 3745-31-05(A)(3)(a)(ii)	The BAT requirements under OAC rule 3745-31-05(A)(3) do not apply to the PE, SO_2, and OC emissions from this air contaminant source since the uncontrolled PTE is less than 10 TPY.
c.	OAC rule 3745-17-11(B)	See b)(2)a.
d.	OAC rule 3745-17-07(A)	See b)(2)b.
e.	OAC rule 3745-18-53(D)(4)	SO_2 emissions shall not exceed 1.98 lbs/MMBtu of actual heat input. See b)(2)c.
f.	OAC rule 3745-31-05(D) [Federally Enforceable Requirements to Comply with OAC rule 3745-110-03(J)]	See b)(2)d.

g.	OAC rule 3745-110-03(J)	The NOx RACT determination in accordance with this rule is equivalent to the lb NOx/MMBtu emission limit established pursuant to OAC rule 3745-31-05(D).

(2) Additional Terms and Conditions

a. The uncontrolled mass rate of PE from this EU is less than 10 lbs/hr. Therefore, pursuant to OAC rule 3745-17-11(A)(2)(a)(ii), Figure II of OAC rule 3745-17-11 does not apply. In addition, Table I of OAC rule 3745-17-11 does not apply because the process weight, as defined in OAC rule 3745-17-01(B)(17), is equal to zero.

b. This EU is exempt from the VE limitations specified in OAC rule 3745-17-07(A), pursuant to OAC rule 3745-17-07(A)(3)(h), because the EU is not subject to the requirements of OAC rule 3745-17-11.

c. The potential SO_2 emissions from this EU are negligible because the combustion of NG is the only source of these emissions (the combustion of NG produces negligible amounts of SO_2 emissions).

d. As required by the reclassification to serious nonattainment for ozone under the 2015 ozone NAAQS promulgated by U.S. EPA, and pursuant to OAC rule 3745-110-03(J) and the NOx Reasonably Available Control Technology (RACT) Study submitted by U.S. Steel on April 22, 2026 (subsequently revised on May 18, 2026): compliance with the NOx emissions limitations established pursuant to OAC rule 3745-31-05(A)(3) are equivalent to NOx RACT. NOx emissions shall not exceed 0.08 lb/MMBtu of actual heat input (as measured at the maximum firing condition) and shall not exceed 21.86 TPY.

c) Operational Restrictions

(1) The permittee shall burn only NG as fuel in this EU.

d) Monitoring and/or Recordkeeping Requirements

(1) For each day during which the permittee burns a fuel other than NG, the permittee shall maintain a record of the type and quantity of fuel burned in this EU.

e) Reporting Requirements

(1) The permittee shall submit deviation (excursion) reports that identify each day when a fuel other than NG was burned in this EU. Each report shall be submitted within 30 days after the deviation occurs.

f) Testing Requirements

(1) Compliance with the Emissions Limitations and/or Control Requirements specified in section b) of these terms and conditions shall be determined in accordance with the following methods:

a. <u>Emission Limitations</u>:

NO_x emissions shall not exceed 0.08 lb/MMBtu of actual heat input (as measured at the maximum firing condition).

NO_x emissions shall not exceed 21.86 TPY.

Applicable Compliance Methods:

Compliance with the short-term NO_x emission limitation has been demonstrated based upon previous emission testing conducted on this EU. If required, compliance shall be demonstrated based upon additional emission testing performed in accordance with the methods and procedures specified in 40 CFR Part 60, Appendix A, Methods 1 through 4 and Method 7, 7E or other USEPA-approved test methods, with prior approval from the Ohio EPA.

The annual emission limitation was developed by multiplying the short-term NO_x emission limitation by the maximum heat input of the furnace, multiplying this product by the maximum annual operating schedule of 8760 hours per year and then dividing by 2000 lbs/ton. Therefore, if compliance is shown with the short-term allowable emission limitation, compliance is demonstrated with the annual emission limitation.

b. Emission Limitations:

CO emissions shall not exceed 5.14 lbs/hr and 22.51 TPY.

Applicable Compliance Methods:

The permittee may demonstrate compliance with the hourly CO emission limitation by multiplying the maximum hourly NG consumption rate (MMcf/hr) by 84 lbs/MMcf (from AP-42, Table 1.4-1, 7/98 version).

If required, the permittee shall demonstrate compliance with the hourly CO emission limitation through emission testing performed in accordance with the methods and procedures specified in 40 CFR Part 60, Appendix A, Methods 1 through 4 and Method 10 or other USEPA-approved test methods, with prior approval from the Ohio EPA.

The annual emission limitation was developed by multiplying the hourly CO emission limitation by the maximum annual operating schedule of 8760 hours per year and dividing by 2000 lbs/ton. Therefore, if compliance is shown with the short-term allowable emission limitation, compliance is demonstrated with the annual emission limitation.

c. Emission Limitation:

SO_2 emissions shall not exceed 1.98 lbs/MMBtu of actual heat input.

Applicable Compliance Methods:

If required, the permittee shall demonstrate compliance with the hourly SO_2 emission limitation through emission testing performed in accordance with the methods and procedures specified in 40 CFR Part 60, Appendix A, Methods 1 through 4 and Method 6 and OAC rule 3745-18-04 or other USEPA-approved test methods, with prior approval from the Ohio EPA.

g) Miscellaneous Requirements

(1) This EU is subject to the requirements of OAC rule 3745-18-53(D) because "Republic Engineered Products, Inc." (Ohio EPA premise number 0247080229) split into two companies. US Steel owns and operates the tube mill side of this plant and operates furnaces subject to OAC 3745-18-53(D)(4). The rule specifies that it applies to "Republic Engineered Products, Inc." (Ohio EPA premise number 0247080229) or any subsequent owner or operator of the "Republic Engineered Products, Inc., 1807 East 28th Street, Lorain, Ohio".

4. P050, Small OD Product Tempering Furnace

Operations, Property and/or Equipment Description:

34.0 MMBtu/hr heat input NG-fired heat treat furnace.

a) The following EU terms and conditions are federally enforceable with the exception of those listed below which are enforceable under state law only.

(1) None.

b) Applicable Emissions Limitations and/or Control Requirements

(1) The specific operation(s), property, and/or equipment that constitute each EU along with the applicable rules and/or requirements and with the applicable emissions limitations and/or control measures are identified below. Emissions from each unit shall not exceed the listed limitations, and the listed control measures shall be specified in narrative form following the table.

	Applicable Rules/Requirements	Applicable Emissions Limitations/Control Measures
a.	OAC rule 3745-31-05(A)(3)	NO_x emissions shall not exceed 0.08 lb/MMBtu of actual heat input (as measured at the maximum firing condition). NO_x emissions shall not exceed 11.91 TPY. CO emissions shall not exceed 2.80 lbs/hr and 12.26 TPY.
b.	OAC rule 3745-31-05(A)(3)(a)(ii)	The BAT requirements under OAC rule 3745-31-05(A)(3) do not apply to the PE, SO_2, and OC emissions from this air contaminant source since the uncontrolled PTE is less than 10 TPY.
c.	OAC rule 3745-17-11(B)	See b)(2)a.
d.	OAC rule 3745-17-07(A)	See b)(2)b.
e.	OAC rule 3745-18-53(D)(4)	SO_2 emissions shall not exceed 1.98 lbs/MMBtu of actual heat input. See b)(2)c. and g)(1).
f.	OAC rule 3745-31-05(D) [Federally Enforceable Requirements to Comply with OAC rule 3745-110-03(J)]	See b)(2)d.

g.	OAC rule 3745-110-03(J)	The NOx RACT determination in accordance with this rule is equivalent to the lb NOx/MMBtu emission limit established pursuant to OAC rule 3745-31-05(D).

(2) Additional Terms and Conditions

a. The uncontrolled mass rate of PE from this EU is less than 10 lbs/hr. Therefore, pursuant to OAC rule 3745-17-11(A)(2)(a)(ii), Figure II of OAC rule 3745-17-11 does not apply. In addition, Table I of OAC rule 3745-17-11 does not apply because the process weight, as defined in OAC rule 3745-17-01(B)(17), is equal to zero.

b. This EU is exempt from the VE limitations specified in OAC rule 3745-17-07(A), pursuant to OAC rule 3745-17-07(A)(3)(h), because the EU is not subject to the requirements of OAC rule 3745-17-11.

c. The potential SO_2 emissions from this EU are negligible because the combustion of NG is the only source of these emissions (the combustion of NG produces negligible amounts of SO_2 emissions).

d. As required by the reclassification to serious nonattainment for ozone under the 2015 ozone NAAQS promulgated by U.S. EPA, and pursuant to OAC rule 3745-110-03(J) and the NOx Reasonably Available Control Technology (RACT) Study submitted by U.S. Steel on April 22, 2026 (subsequently revised on May 18, 2026): compliance with the NOx emissions limitations established pursuant to OAC rule 3745-31-05(A)(3) are equivalent to NOx RACT. NOx emissions shall not exceed 0.08 lb/MMBtu of actual heat input (as measured at the maximum firing condition) and shall not exceed 11.91 TPY.

c) Operational Restrictions

(1) The permittee shall burn only NG as fuel in this EU.

d) Monitoring and/or Recordkeeping Requirements

(1) For each day during which the permittee burns a fuel other than NG, the permittee shall maintain a record of the type and quantity of fuel burned in this EU.

e) Reporting Requirements

(1) The permittee shall submit deviation (excursion) reports that identify each day when a fuel other than NG was burned in this EU. Each report shall be submitted within 30 days after the deviation occurs.

f) Testing Requirements

(1) Compliance with the Emissions Limitations and/or Control Requirements specified in section b) of these terms and conditions shall be determined in accordance with the following methods:

a. <u>Emission Limitations</u>:

NO_x emissions shall not exceed 0.08 lb/MMBtu of actual heat input (as measured at the maximum firing condition).

NO_x emissions shall not exceed 11.91 TPY.

Applicable Compliance Methods:

Compliance with the lb NO_x/MMBtu emission limitation has been demonstrated based upon previous emission testing conducted on this EU. If required, compliance shall be demonstrated based upon additional emission testing performed in accordance with the methods and procedures specified in 40 CFR Part 60, Appendix A, Methods 1 through 4 and Method 7, 7E or other USEPA-approved test methods, with prior approval from the Ohio EPA.

The annual emission limitation was developed by multiplying the short-term NO_x emission limitation (0.08 lb/MMBtu) by the maximum heat input of the furnace (34 MMBtu/hr), multiplying this product by the maximum annual operating schedule of 8760 hours per year and then dividing by 2000 lbs/ton. Therefore, if compliance is shown with the short-term allowable emission limitation, compliance is demonstrated with the annual emission limitation.

b. Emission Limitations:

CO emissions shall not exceed 2.80 lbs/hr and 12.26 TPY.

Applicable Compliance Methods:

The permittee may demonstrate compliance with the hourly CO emission limitation by multiplying the maximum hourly NG consumption rate (MMcf/hr) by 84 lbs/MMcf (from AP-42, Table 1.4-1, 7/98 version).

If required, the permittee shall demonstrate compliance with the hourly CO emission limitation through emission testing performed in accordance with the methods and procedures specified in 40 CFR Part 60, Appendix A, Methods 1 through 4 and Method 10 or other USEPA-approved test methods, with prior approval from the Ohio EPA.

The annual emission limitation was developed by multiplying the hourly CO emission limitation by the maximum annual operating schedule of 8760 hours per year and dividing by 2000 lbs/ton. Therefore, if compliance is shown with the short-term allowable emission limitation, compliance is demonstrated with the annual emission limitation.

c. Emission Limitation:

SO_2 emissions shall not exceed 1.98 lbs/MMBtu of actual heat input.

Applicable Compliance Methods:

If required, the permittee shall demonstrate compliance with the hourly SO_2 emission limitation through emission testing performed in accordance with the methods and procedures specified in 40 CFR Part 60, Appendix A, Methods 1 through 4 and Method 6 and OAC rule 3745-18-04 or other USEPA-approved test methods, with prior approval from the Ohio EPA.

g) Miscellaneous Requirements

(1) This EU is subject to the requirements of OAC rule 3745-18-53(D) because “Republic Engineered Products, Inc." (Ohio EPA premise number 0247080229) split into two companies. US Steel owns and operates the tube mill side of this plant and operates furnaces subject to OAC 3745-18-53(D)(4). The rule specifies that it applies to "Republic Engineered Products, Inc." (Ohio EPA premise number 0247080229) or any subsequent owner or operator of the "Republic Engineered Products, Inc., 1807 East 28th Street, Lorain, Ohio".

NOX REASONABLY AVAILABLE CONTROL TECHNOLOGY (RACT) STUDY

U. S. Steel Lorain Tubular Products/ Lorain, Ohio

Prepared By:

TRINITY CONSULTANTS
29425 Chagrin Blvd.
Suite 360
Pepper Pike, OH 44124
(216) 278-0500

April 2026
Revision 1 – May 2026

Project 263602.0049

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDIX: LIST OF FIGURES

APPENDIX: LIST OF TABLES

1. BACKGROUND

1.1 Reasonably Available Control Technology (RACT) Study

On March 25, 2022, Ohio EPA promulgated revisions to the existing NOx regulations under Chapter 3745-110 of the Ohio Administrative Code (OAC) due to the downgrade to moderate nonattainment status for the Cleveland area with respect to the 2015 8-hr Ozone National Ambient Air Quality Standard (NAAQS) as well as the change to marginal nonattainment status for the Cincinnati area.

For affected NOx-emitting sources that were not subject to presumptive emission limits and were not otherwise exempt, or for sources subject to presumptive NOx RACT emission limits where the owner or operator claimed the applicable limit was technically infeasible and/or economically unreasonable (i.e., not cost-effective), the owner or operator was required to conduct a detailed engineering study. This study was required to evaluate the technical and economic feasibility of reducing NOx emissions and to establish RACT for the affected sources. U. S. Steel submitted a RACT study in March 2023 for one tempering furnace, one reheat furnace, and three rotary furnaces (i.e., Ohio EPA Emission Unit IDs P003, P035, P037, P039, and P040) which have a potential to emit greater than 25 tons per year (tpy).

On April 1, 2025, Ohio EPA promulgated additional revisions to the NOx regulations under Chapter 3745-110 of the OAC following the reclassification of the Cleveland area to serious nonattainment for the 2015 8-hour Ozone NAAQS. One of these revisions lowered the exemption threshold in OAC 3745-110-03(K)(16) from 25 tpy to 10 tpy for sources located in Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, and Summit counties.

The Lorain Facility operates additional emission units, which were previously exempt from the requirements of OAC 3745-110 because their potential NOx emissions were less than 25 tpy; however, due to recent revisions to the exemption threshold in OAC 3745-110-03(K)(16), the following emission units no longer qualify:

- P002 - No. 3 Seamless Q & T Austenitizing Furnace
- P036 - No. 3 Seamless Mill No. 1 Reheat Furnace
- P049 - Small OD Product Austenitizing Furnace
- P050 - Small OD Product Tempering Furnace

Accordingly, U. S. Steel is submitting the RACT Study for P002, P036, P049, and P050 in accordance with OAC 3745-110-03(J).

2. FACILITY OVERVIEW

U. S. Steel Corporation (U. S. Steel) owns and operates U. S. Steel Lorain Tubular Products (Lorain Facility), a fully integrated tubular products manufacturing site, located in Lorain County. The Lorain Facility manufactures high-quality seamless pipe used in oil and gas exploration and production as well as the construction industry.

The Lorain Facility is located at 2199 E. 28th Street, Lorain, Ohio. Emissions sources at the Lorain Facility include reheat furnaces, rotary furnaces, and tempering furnaces. Operations at the Lorain Facility are authorized under Title V operating permit No. P0129155, effective December 28, 2021. However, the Lorain Facility has been idled since mid-2020 due to global influences in the market such as the COVID-19 pandemic, unfair trade practices, imports, and fluctuations in oil prices.

Figure 2-1 is an area map that shows the site location relative to predominant geographical features such as highways and railroads.

Figure 2-1. Area Map for U. S. Steel Tubular Products

Facility information required by sections (a) through (d) of OAC 3745-110-03(J)(1) is provided as follows:

(a) The complete facility name, Ohio EPA facility identification number, and address:

U. S. Steel Seamless Tubular Operations, LLC
Facility ID 02-47-08-0961
2199 East 28th Street
Lorain, Ohio 44055

(b) The name, title, address and telephone number of the owner or operator's representative within the company who is the contact person for this facility regarding the engineering study and affected sources:

Mr. Richard Saut
United States Steel Corporation

5700 Valley Rd.
Fairfield, AL 35064-0599
Telephone Number: (205) 783-4105

(c) The name, title, address and telephone number of the official who is responsible for approval of the engineering study:

Mr. Jeremy Croushore
United States Steel Corporation
Lorain Tubular Operations
2199 East 28th Street
Lorain, Ohio 44055
Telephone Number: (440) 240-2709

(d) The standard industrial classification code and source classification code numbers which are applicable to the facility's operation:

SIC: 3317
SCC: 3-03-015-99

2.1 Permitted NOx Sources

Table 2-1 summarizes the sources that were previously exempt from the requirements of OAC 3745-110 because their potential NOx emissions were less than 25 tpy. However, due to the recent revisions to the exemption threshold in OAC 3745-110-03(K)(16) associated with the escalation to serious nonattainment, U. S. Steel is now required to conduct a RACT study for these emission units pursuant to OAC 3745-110-04(A)(2).

Table 2-1. Summary of Permitted NOx Sources Included in RACT Study

Emission Unit ID	Emission Unit Description	Rated Capacity (MMBtu/hr)	Fuels Burned	NOx PTE (tpy)	Current NOx Emission Limit(s)
P002	No. 3 Seamless Q & T Austenitizing Furnace	50	NG	15.77	0.072 lb/MMBtu 3.6 lbs/hr 15.8 tpy
P036	No. 3 Seamless Mill No. 1 Reheat Furnace	30.8	NG	20.24	0.15 lb/MMBtu
P049	Small OD Product Austenitizing Furnace	62.4	NG	21.86	0.08 lb/MMBtu 21.86 tpy
P050	Small OD Product Tempering Furnace	34.0	NG	11.91	0.08 lb/MMBtu 11.91 tpy

3. RACT DEFINITION AND METHODOLOGY

"RACT," "BACT," and "LAER" are acronyms for different levels of emissions control. The least stringent is RACT, more stringent is BACT, and the most stringent is LAER. The type of control required depends on the size of the stationary source and whether it is in an attainment or nonattainment area (NAA).

- RACT, or Reasonably Available Control Technology, is required on new minor sources in Ohio and on existing major sources of NOx and VOC in the ozone NAA.
- BACT, or Best Available Control Technology, is required for new major stationary sources and major modifications in attainment areas subject to Prevention of Significant Deterioration (PSD) permitting requirements.
- LAER, or Lowest Achievable Emission Rate, is required for new major stationary sources and major modifications in nonattainment areas subject to Nonattainment New Source Review permitting requirements.

At the federal level, RACT is not defined by statute or rule, rather it is defined in EPA guidance as "the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility."[1]

Considering this definition, RACT involves identifying implementable control technologies with due consideration given to technological and economic feasibility. Since RACT considers the technological and economic impacts of controls, the analysis and determination may differ from source to source and location to location.

3.1 Top-down Approach

In this RACT study, U. S. Steel is using the U.S. Environmental Protection Agency's (USEPA's) top-down approach to determining the feasibility of control technology where the most stringent control available for a similar or identical source or source category is identified. This control option is used to establish the RACT emission limitation, unless the applicant can demonstrate (and the permitting authority agrees) that it is not "achievable" due to technical infeasibility or not being cost effective and potentially having other adverse environmental or energy consequences of implementing the technology. If the top control alternative is eliminated, then the next most stringent level of control is evaluated. This process continues until RACT is selected. The five steps in a top-down RACT evaluation can be summarized as follows:

- Step 1. Identify all possible control technologies
- Step 2. Eliminate technically infeasible options
- Step 3. Rank the technically feasible control technologies based upon emission reduction potential
- Step 4. Evaluate ranked controls based on energy, environmental, and/or economic considerations
- Step 5. Select RACT

The following sections contain a description of the five (5) basic steps of this "top-down" approach.

[1] 44 Fed. Reg. 53762 (9/17/1979)

3.1.1 Step 1 – Identify All Control Options

In this step, available control technologies with the practical potential for application to the emission unit and regulated air pollutant in question are identified. The selected control technologies vary widely depending on the process technology and pollutant being controlled. The application of demonstrated control technologies in other similar source categories to the emission unit in question may also be considered in this step.

The following resources are typically consulted when identifying potential technologies for criteria pollutants:

- EPA's RACT/BACT/LAER Clearinghouse (RBLC) database
- NSPS, NESHAP, and RACT regulations for similar operations
- Engineering experience with similar control applications
- Information provided by air pollution control equipment vendors with significant market share in the industry

3.1.2 Step 2 – Eliminate Technically Infeasible Options

In this step, "technically infeasible" control options from the list of "potentially available" control options are eliminated. A control option is "technically feasible" if it has been "demonstrated" or if it is both "available" and "applicable."

3.1.3 Step 3 – Rank Remaining Control Options

All remaining technically feasible control options are ranked based on their overall control effectiveness for the pollutant under review. If there is only one remaining option or if all the remaining technologies could achieve equivalent control efficiencies, ranking based on control efficiency is not required. Collateral effects are usually not considered until step four of the five step top-down RACT analysis.

3.1.4 Step 4 – Evaluation of Most Effective Control Option

After identifying and ranking available and technically feasible control technologies, the economic, environmental, and energy impacts are evaluated to select the best control option. If collateral impacts do not disqualify the top-ranked option from consideration, it is selected as the basis for the RACT limit. Alternatively, in the judgment of the permitting agency, if economic, environmental, or energy considerations impact the top control option, the next most stringent option is evaluated. This process continues until a control technology is identified. This step validates the suitability of the top control option identified or provides a clear justification as to why the top option should not be selected as RACT.

3.1.5 Step 5 – Select RACT

In the final step, the RACT is determined for each emission unit under review based on evaluations from the previous step.

4. AUSTENITIZING AND TEMPERING FURNACES

Emission unit P002 is a natural gas-fired austenitizing furnace with a total firing capacity of 50 MMBtu/hr and is equipped with 32 low-NOx burners (LNBs) distributed across eight zones. P049 is also a natural gas-fired austenitizing furnace with a total heat input capacity of 62.4 MMBtu/hr and is equipped with 32 LNBs across nine zones. P050 is a natural gas-fired tempering furnace with a total heat input capacity of 34 MMBtu/hr and is equipped with 12 total LNBs across 12 zones.

For purposes of NOx RACT applicability screening, the Ohio presumptive NOx RACT emission limit for steel reheat furnaces (0.09 lb/MMBtu) was used as a technically reasonable and conservative benchmark for evaluating these units. While unit-specific presumptive RACT limits have not been established for austenitizing and tempering furnaces under OAC 3745-110, these furnace types share similar combustion characteristics with steel reheat furnaces. In particular, they operate at comparable temperature ranges, utilize natural gas-fired burners, and generate NOx emissions primarily through similar thermal and fuel-related formation mechanisms.

In addition, these units employ comparable combustion-based NOx control strategies, including the use of LNBs and optimized burner combustion practices. Given these similarities, the steel reheat furnace presumptive limit is considered an appropriate and conservative reference point for evaluating whether these units achieve RACT-level control.

Emission units P002, P049, and P050 are subject to enforceable NOx emission limits of 0.072 lb/MMBtu, 0.08 lb/MMBtu, and 0.08 lb/MMBtu, respectively. Compliance with these limits is achieved through the installation and operation of LNBs. Each of these limits is more stringent than the Ohio presumptive NOx RACT limit of 0.09 lb/MMBtu for steel reheat furnaces.

Based on the fact that these units are currently achieving emission rates below a conservative presumptive RACT benchmark through the use of established combustion controls, the existing control configurations are determined to represent RACT for emission units P002, P049, and P050. Accordingly, these units were screened out of further RACT evaluation, and no additional analysis of alternative or add-on NOx control technologies is warranted.

5. NOX TOP-DOWN RACT STUDY

The following section presents the top-down NOx RACT analysis conducted for emission unit P036, the No. 3 Seamless Mill No. 1 Reheat Furnace. As discussed in the previous section, emission units P002, P049, and P050 were determined to satisfy RACT based on existing emission limits and were therefore screened out of further evaluation. Because P036 is not subject to a presumptive NOx RACT emission limit under OAC Chapter 3745-110, a case-by-case analysis is required. Consistent with U.S. EPA guidance, a top-down approach was applied to identify and evaluate potential NOx control technologies for this unit.

The No. 3 Seamless Mill No. 1 Reheat Furnace (P036) is a natural gas-fired, reheat furnace with a maximum firing capacity of 30.8 MMBtu/hr and an existing enforceable NOx emission limit of 0.15 lb/MMBtu. The furnace is fired by 12 conventional burners in two zones.

Appendix B provides the source specific information required by OAC 3745-110-03(J)(1)(e) through (g).

5.1 Overview of Potentially Applicable NOx Control Technologies

NOx control technologies can lower emissions by minimizing NOx formation or reducing emissions to atmosphere after it is generated. Thermal NOx is formed through high temperature oxidation of nitrogen found in the combustion air. The rate at which NOx is formed depends on the reaction temperature, nitrogen and oxygen concentrations, as well as the residence time at a given temperature. The concentration of thermal NOx can be controlled by regulating the nitrogen and oxygen molar concentrations as well as the combustion temperature. Fuel NOx is formed by the reaction of burning fuels that contain nitrogen with oxygen in the combustion air. Fuel NOx can be controlled by utilizing other types of fuels that contain lower nitrogen such as blast furnace gas, reducing flame temperatures as well as reducing excess oxygen. Lastly, prompt NOx is formed during the early stages of combustion and occurs in the presence of hydrocarbon radicals in fuel rich flames.

OAC 3745-110-03(J)(1)(h) provides a list of at least 22 NOx control measures that should be evaluated as part of the NOx RACT study. However, not all of the listed control measures are applicable to the furnaces included in this RACT study. The following sections outline the potential applicability of each of the listed NOx control measures to the emission units included in this study.

5.1.1 Close Coupled or Separated Over-Fire Ports

Close coupled or separated over-fire ports implement air staged combustion to create a fuel-rich mixture in the main combustion zone. By reducing the amount of combustion air introduced in the primary combustion zone, the combustion temperature is reduced, which in turn lowers thermal NOx formation. After partial combustion occurs in the primary zone, the excess air needed to complete combustion is admitted through over-fire ports typically located above the highest level of burners in the furnaces. This control technology is applicable to combustion sources that burn a variety of fuels and is generally applicable to boilers. This option is not applicable to natural gas-fired furnaces where the secondary air is integrated into the burner and is therefore not applicable to the furnaces considered in this study.

5.1.2 Burners Out of Service (BOOS)

Burners Out of Service (BOOS) is a form of fuel staged combustion that reduces the formation of thermal NOx by reducing combustion temperature. Staged combustion is achieved by having multiple burners out of service (i.e., not feeding fuel and instead supplying air) and the fuel required to maintain the unit firing rate is redistributed to the remaining burners. Some of the disadvantages of this technique include high CO emissions, potentially uneven temperature profiles, and oxygen imbalances. While effective under steady-state and well-controlled firing conditions, this technique is not well suited for a reheat furnace characterized by frequent door cycling, variable firing rates, and continuously changing furnace load. The repeated opening and closing of furnace doors and resulting air in-leakage disrupt internal flow patterns and oxygen distribution, while variable production demand requires rapid and dynamic burner turndown and ramping. Under these conditions, operating with burners out of service would exacerbate combustion instability, increase the potential for elevated CO emissions, and lead to uneven temperature profiles that are incompatible with uniform product heating requirements. Accordingly, this approach is not technically feasible to implement on the affected sources and is therefore not applicable for this study.

5.1.3 Flue Gas Recirculation (FGR)

Flue Gas Recirculation is another type of NOx control measure that reduces the formation of thermal NOx by reducing combustion temperature. The flame temperature is lowered by recirculating cooled flue gas and diluting the oxygen content of the combustion air. FGR is not considered a reasonable control option for reheat furnaces due to the potential drawbacks (e.g., uneven temperature profiles which can affect product quality). U. S. Steel is not aware of FGR being utilized at reheat furnaces within the steel industry. Accordingly, FGR has not been demonstrated as a technically feasible control technology for this application and is therefore not applicable for this study.

5.1.4 Low-NOx Burners (LNB) with External Flue Gas Recirculation

LNBs with external flue gas recirculation use cooled flue gases from the exhaust stacks to dilute the combustion process. The inert compounds in the flue gas streams (nitrogen, water vapor, and carbon dioxide) serve as heat sinks and can reduce combustion temperature. The flue gas mixed with the combustion air enters the burners through dedicated recirculation pipes. Recirculating flue gas in the current system would require extensive modifications. This control technology is not considered a reasonable control option due to its potential drawbacks (i.e., uneven temperature profiles). Accordingly, this technology is not considered feasible for the affected sources and is therefore not applicable for this study.

5.1.5 Steam/Water Injection

Steam/water injection is a type of control measure whereby water or steam is injected into the combustion zone to lower the flame temperature. However, this technology results in reduced thermal efficiency due to the amount of energy required to produce the steam (if steam injection is used). Further, fuel consumption also increases to account for the heat of vaporization of water. Due to the efficiency penalty, the excess fuel consumption, and potentially uneven temperature profiles, this technology is not considered technically feasible for the affected sources and is therefore not applicable for this study.

5.1.6 Dry Low NOx Burners

Dry LNBs are special types of burners used to reduce NOx emissions from gas fired turbines. The configuration of this control technology is only suitable for gas turbines. U. S. Steel does not operate emission sources for which this technology is applicable; as such, this control measure is not applicable for this study.

5.1.7 Ignition Timing Retard

Ignition timing retard is a NOx control technique used in internal combustion engines to control peak combustion temperature and residence time. This control measure is not applicable to the combustion processes associated with the affected sources included in this RACT study.

5.1.8 Adjustment of Air/Fuel Ratio (for internal combustion engines only)

Internal combustion engines use adjustment of the air-to-fuel ratio to control peak combustion temperature and residence time, resulting in lower NOx emissions. This control measure is not applicable to the combustion processes associated with the affected sources included in this RACT study.

5.1.9 Fuel Emulsification

Fuel emulsification is a type of NOx control technology whereby thermal NOx generation is reduced by decreasing combustion temperatures. Reduction in combustion temperatures is achieved by injecting water into the liquid fuels burned in the combustion source. This control measure is generally applicable to liquid-fuel combustion systems and is not applicable for the affected sources included in this RACT study.

5.1.10 Separate Circuit After-Cooling

This control technology is applicable to internal combustion engines and works by adding a separate water circuit to cool the engine's intake air. This control measure is not applicable to the combustion processes associated with the affected sources included in this RACT study.

5.1.11 Non-Selective Catalytic Reduction (NSCR)

Non-Selective Catalytic Reduction (NSCR) is an add-on NOx control technology which uses catalysts to reduce NOx emissions from internal combustion engines, typically rich-burn engines. To achieve optimum NOx reduction, the oxygen content of the exhaust streams must be low. This control measure is not applicable to the combustion processes associated with the affected sources included in this RACT study.

5.1.12 Incineration (for sources other than boilers)

Incinerators are typically used to control emissions from facilities that operate paint lines or have hazardous waste. U. S. Steel does not operate sources for which this technology can be applied; as such, this control measure is not applicable for this study.

5.1.13 Scrubbing (for sources other than boilers)

Wet scrubbers can control NOx emissions from certain process operations, such as pickling operations, using alkali solutions, water, or hydrogen peroxide as the scrubbing liquid to absorb NOx compounds. This control technology is not applicable to NOx emissions from the affected sources included in this RACT study.

5.1.14 Process Modification

Process modification is not considered a feasible control option for the affected sources because the furnace design and operation are integral to achieving the required steel heating rates, temperature profiles, and product quality specifications. Accordingly, process modification is not applicable for the affected sources included in this RACT study.

5.1.15 Low Excess Air (LEA)

Low Excess Air (LEA) is a type of control measure whereby the net excess air flow is minimized to reduce combustion temperature and oxygen availability, thereby reducing potential NOx formation. Although LEA is applicable to combustion sources that burn a variety of fuels, insufficient air supply or operation at excessively low excess air levels can result in incomplete combustion, reduced combustion efficiency, and increased CO emissions. Further, LEA can also lead to uneven temperature profiles and heat distribution, which are critical parameters affecting the quality of U. S. Steel's products. Due to the need to maintain stable combustion and uniform product heating, operation at excessively low excess air levels is not considered technically feasible for the affected sources and therefore is not applicable for this study.

5.1.16 Gaseous Fuels Reburn

Fuel reburning is a NOx control measure whereby a secondary fuel stream is injected downstream of the primary combustion zone for chemical reduction of NOx to molecular nitrogen. In addition to chemically reducing NOx, the primary combustion temperature is lowered, reducing thermal NOx formation. However, this control measure could affect furnace temperature profiles, which are critical parameters affecting the quality of U. S. Steel's products. Accordingly, this technology is not considered technically feasible for the affected sources and is therefore not applicable for this study.

5.1.17 Mid-Kiln Firing

In mid-kiln firing, fuel is added at a midpoint within a kiln system, which changes both the flame temperature and flame length. These changes can reduce thermal NOx formation by burning part of the fuel at a lower temperature. This control measure is not applicable for the affected sources included in this RACT study.

5.1.18 Mid-kiln Air Injection

Mid-kiln air injection is a combustion-staging technique used in kiln applications in which combustion air is introduced at intermediate locations within the kiln to reduce peak flame temperatures and lower NOx formation. This control measure is not applicable for the affected sources included in this RACT study.

5.1.19 LNBs

LNBs implement fuel or air staging to reduce combustion temperatures and lower thermal NOx formation. Air staging in the primary combustion zone creates "fuel-rich" combustion zones where the formation of NOx is disrupted due to reduced oxygen availability and lower combustion temperatures. The additional air required for complete combustion is supplied outside the main combustion zone. Fuel staging works similarly to air staging whereby the primary combustion zone is operated under fuel-rich conditions followed by downstream completion of combustion. Under this condition, thermal NOx formation is lowered due to reduced combustion temperatures. Like air staging, the additional air or fuel necessary to complete combustion is supplied downstream of the primary combustion zone. LNBs are potentially applicable to the affected sources; as such, this control measure is included for consideration in this study.

5.1.20 Selective Catalytic Reduction (SCR)

SCR is a post-combustion add-on control technology in which ammonia is injected into the flue gas upstream of the catalyst bed to reduce NOx into elemental nitrogen and water. SCR systems employ metal-based catalysts with activated sites to increase the reduction rate of NOx. Critical parameters affecting the reduction rate of NOx include reaction temperature range, residence time available in the optimum temperature range, molar ratio of injected ammonia to uncontrolled NOx, degree of mixing between ammonia and NOx, and ammonia slip. The reaction temperature for the reduction reaction ranges between 480-800 °F, with optimum NOx removal occurring at approximately 700 °F. Efficient SCR systems require stable flue gas conditions with respect to temperature, flow rate, and NOx concentrations. If designed and operated efficiently, SCR systems can reduce NOx emissions by 70% - 90%.[2] SCR is potentially applicable to the affected sources; as such, this control measure is included for consideration in this study.

5.1.21 Selective Noncatalytic Reduction (SNCR)

Similar to SCR systems, SNCR is a type of post-combustion add-on NOx emissions control technology whereby ammonia or urea is injected into the combustion gas stream to reduce NOx into elemental nitrogen and water. The key difference between SCR and SNCR is that SCR uses a catalyst for the reduction reaction to take place. However, for SNCR systems to be effective, the ammonia or urea must be injected into a region with a narrow temperature range (usually 1600–2100 °F). Different factors such as temperature, residence time, type of reducing agent, reagent injection rate, mixing characteristics, and uncontrolled NOx level affect the reduction potential of this technology. The reaction temperature is critical since heat is needed to drive the reaction. At lower temperatures, reaction kinetics are slow, resulting in potential ammonia slip. At higher temperatures, ammonia oxidizes resulting in additional NOx formation. If designed and operated efficiently, SNCR systems can reduce NOx emissions by 70% - 90%.[3] SNCR is potentially applicable to the affected sources. As such, this control measure is included for consideration in this study.

5.1.22 Fuel Switching

The order of fuels based on highest NOx emissions is coal, oil, natural gas. The affected furnaces operating at the Lorain Facility burn natural gas exclusively. Accordingly, fuel switching is not an option considered in this study.

5.1.23 RACT Alternatives

The U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC) was reviewed to identify NOx control technologies applied to similar combustion sources. The RBLC review included determinations for steel reheat furnaces, forging furnaces, annealing furnaces, heat treating furnaces, and other high-temperature natural gas-fired process heaters. The review identified combustion controls, including low-NOx burners and combustion optimization, as the primary NOx control technologies applied to reheat furnace operations, with selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR) identified in limited applications for certain combustion sources. No additional control technologies applicable to the affected sources were identified through the RBLC review. Accordingly, no additional technologies are carried forward for evaluation in this study.

5.2 Step 1 – Identify Control Options

U. S. Steel identified the following technologies as potentially applicable for reducing NOx emissions from P036:

- Low-NOx Burners;
- Selective Catalytic Reduction; and

[2] U.S. EPA Cost Control Manual, 2002. https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution#cost%20manual

[3] *Ibid*

- Selective Non-Catalytic Reduction.

The technical feasibility of each of these options is discussed in Step 2 below.

5.3 Step 2 – Eliminate Technically Infeasible Options

5.3.1 Selective Catalytic Reduction (SCR)

Application of Selective Catalytic Reduction (SCR) to emission unit P036 was evaluated as part of this RACT analysis. Based on the design and operational characteristics of this unit, SCR was determined to be technically infeasible for the following reasons.

First, P036 is a relatively small reheat furnace with a rated heat input capacity of approximately 30.8 MMBtu/hr. As a result, the unit generates a relatively low exhaust gas flow and operates under highly variable and non-steady-state conditions. Reheat furnace operation inherently involves fluctuations in firing rate, throughput, and combustion conditions, which lead to corresponding variability in flue gas temperature and composition. Effective SCR performance requires a relatively stable and sustained temperature window, typically in the range of approximately 480°F to 800°F, to maintain catalyst activity and achieve consistent NOx reduction efficiency. The transient operating profile of P036 does not provide a reliable or controllable temperature regime within this range. Operation outside of the optimal temperature window would result in reduced NOx control efficiency, increased ammonia slip, and accelerated catalyst degradation, leading to significant operational and maintenance challenges.

Second, the physical and operational configuration of reheat furnaces further limits the feasibility of SCR application. Reheat furnaces are typically designed with charge and discharge doors that open and close frequently to allow steel products to enter and exit the furnace. These repeated openings introduce significant and rapid fluctuations in furnace pressure, airflow, and exhaust gas temperature. Such fluctuations are inherently incompatible with SCR system requirements, which depend on relatively uniform flow distribution, consistent residence time, and stable thermal conditions across the catalyst bed. Achieving these conditions would likely require substantial redesign of the furnace exhaust system, including ductwork modifications and the addition of supplemental heating or gas conditioning systems, which are not practical for a unit of this size and design.

Third, available industry experience and regulatory precedent indicate that SCR is not a demonstrated or viable control option for reheat furnaces of this type and size. U. S. Steel is aware of only one SCR installation on a steel reheat furnace (Beta Steel, Indiana), which was permitted under PSD requirements in 2003. However, subsequent permitting actions for that facility documented that the non-steady-state nature of reheat furnace operation prevented consistent SCR performance, ultimately necessitating a relaxation of the permitted NOx emission limit from 0.014 lb/MMBtu to 0.077 lb/MMBtu. This documented performance limitation highlights the inherent incompatibility of SCR technology with the transient operating conditions of reheat furnaces.

Finally, a review of available information, including EPA's RACT/BACT/LAER Clearinghouse (RBLC), does not indicate widespread or successful application of SCR on reheat furnaces comparable to P036, particularly for units with similar size and variable operating characteristics. The absence of demonstrated applications further supports the conclusion that SCR is not technically feasible for this source category.

Based on the combination of limited exhaust gas flow, highly variable operating conditions, incompatible temperature profiles, and lack of demonstrated successful application within the industry, SCR is not technically feasible for emission unit P036 and was therefore eliminated from further consideration in this RACT analysis.

5.3.2 Selective Non-Catalytic Reduction

Application of SNCR to P036 was evaluated as part of this RACT study. Based on the design and operating characteristics of this unit, SNCR was determined to be technically infeasible for the following reasons.

First, effective SNCR performance requires a well-defined and consistently maintained temperature zone within the appropriate reaction window. The transient operating profile of P036, including variable firing rates and frequent changes in furnace load, results in significant fluctuations in combustion conditions and flue gas temperatures. These conditions do not provide a stable or controllable temperature region suitable for reliable reagent injection. As a result, SNCR application would be expected to result in inconsistent NOx control performance and an increased risk of ammonia slip.

Second, the physical configuration and size of P036 limit the ability to achieve adequate residence time and effective mixing of the injected reagent with the flue gas. SNCR requires sufficient residence time within the optimal temperature window to allow the reduction reactions to proceed to completion. Due to the relatively small size of the furnace and the short gas path lengths, achieving adequate residence time would be difficult without substantial modifications to the furnace or exhaust system. In addition, the turbulent and variable flow conditions associated with reheat furnace operation hinder uniform reagent distribution, further limiting control effectiveness.

Third, the operational characteristics of reheat furnaces inherently complicate SNCR application. Frequent opening and closing of furnace doors to charge and discharge material introduces rapid fluctuations in airflow, temperature, and pressure within the furnace, disrupting the conditions necessary for consistent SNCR performance. Maintaining precise control of reagent injection under these dynamic conditions is not practicable.

Fourth, the overall scale of NOx emissions from P036 further supports the conclusion that SNCR is not a technically appropriate control option. The unit has a potential-to-emit (PTE) of approximately 20.24 tons per year of NOx, which is relatively low compared to sources where SNCR is typically applied. SNCR systems are generally implemented on larger combustion sources with higher and more consistent NO_x mass loading, where stable operating conditions and sufficient reaction volume are available to support effective performance.

Finally, available industry experience and regulatory precedent indicate that SNCR is not a demonstrated or commonly applied control technology for reheat furnaces of this size and type. A review of available information, including EPA's RACT/BACT/LAER Clearinghouse (RBLC), does not indicate successful or widespread application of SNCR on comparable small reheat furnaces. Instead, NOx control for these units is typically achieved through combustion-based measures, such as low-NOx burners and optimized combustion practices, reflecting both technical feasibility and established industry practice.

Based on the inability to maintain the required temperature window, limited residence time and mixing, highly variable operating conditions, relatively low NOx emissions, and lack of demonstrated industry application, SNCR is not technically feasible for emission unit P036 and was therefore eliminated from further consideration in this RACT analysis.

5.3.3 Low-NOx Burners (LNBs)

Emission unit P036 is currently equipped with conventional burners. As part of the case-by-case NOx RACT analysis, the installation of advanced LNB systems was evaluated as a potential combustion-based control option for this unit.

The results of the economic feasibility evaluation for installation of LNBs are presented in the following sections.

5.4 Step 3 – Rank Remaining Control Options

For the reasons discussed above, LNBs are the only control option evaluated in this study.

5.5 Step 4 – Economic Feasibility

As discussed in the previous section, installation of LNB designs was evaluated as a potential control option for P036.

The cost estimate for LNB installation was developed using cost data from a prior RACT analysis for emission unit P040, a reheat furnace of similar size, design, and operating characteristics. Because the primary cost drivers for LNB retrofit projects—such as burner count, associated valving, controls, and installation scope – scale in a reasonably proportional manner across comparable furnace configurations, the P040 cost data were considered representative for study-level estimating purposes. Equipment and installation costs from that analysis were used to derive a per-burner cost, which was then applied to P036 based on its burner configuration, with adjustments made to account for inflation. The detailed cost calculations are provided in Appendix C.

A summary of the cost-effectiveness estimates for P036 is shown in Table 5-1 below.

Table 5-1. Cost-Effectiveness of Installing New LNBs for P036

Total Capital Investment (TCI)	Total Annual Costs	NOx removed (tpy)	Cost Effectiveness ($/ton)
$1,861,062	$275,562	10.25	$26,877.05

As shown in Table 5-1, it is not economically feasible to install new LNBs in P036 for RACT purposes.

5.6 Step 5 – Select RACT

As discussed in Section 4, emission units P002, P049, and P050 are subject to enforceable NOx emission limits of 0.072 lb/MMBtu, 0.08 lb/MMBtu, and 0.08 lb/MMBtu, respectively. Each of these limits is more stringent than the Ohio presumptive NOx RACT limit of 0.09 lb/MMBtu for steel reheat furnaces.

Additionally, based on the evaluation of available control technologies, no add-on or additional combustion-based control options were determined to be both technically feasible and economically reasonable for emission unit P036.

Accordingly, Table 5-2 below summarizes the proposed NOx RACT limits for each emission unit, which are equivalent to the existing NOx limits.

Table 5-2. Proposed NOx RACT Limits

Emission Unit	Emission Unit Description	Proposed NOx RACT Limit
P002	No. 3 Seamless Q & T Austenitizing Furnace	0.072 lb/MMBtu 3.6 lbs/hr 15.8 tpy
P036	No. 3 Seamless Mill No. 1 Reheat Furnace	0.15 lb/MMBtu
P049	Small OD Product Austenitizing Furnace	0.08 lb/MMBtu 21.86 tpy
P050	Small OD Product Tempering Furnace	0.08 lb/MMBtu 11.91 tpy

APPENDIX A. POTENTIAL NOX EMISSIONS

U.S. Steel Lorain Tubular Products
Lorain, OH
Potential NOx Emissions Estimates

DIMENSIONAL ANALYSIS

Time Conversion	8,760	hrs/yr
Mass Conversion	2,000	lb/ton

POTENTIAL PROCESS DATA

Emission Unit ID	Equipment Description	Heat Input Rating (MMBtu/hr)	NO_x Emission Factors	Units	Emission Factor Source	Potential NO_x Emissions (tpy)
P002	No. 3 Seamless Q & T Austenitizing Furnace	50	0.072	lb/MMBtu	Title V Operating Permit, P0129155	15.77
P036	No. 3 Seamless Mill No. 1 Reheat Furnace	30.8	0.15	lb/MMBtu		20.24
P049	Small OD Product Austenitizing Furnace	62.4	0.08	lb/MMBtu		21.86
P050	Small OD Product Tempering Furnace	34.0	0.08	lb/MMBtu		11.91

[a] *Potential NO_x Emissions (tpy) = Heat Input (MMBtu/hr) x 8760 (hrs/yr) x NO_x Emission Factor (lb/MMBtu) / 2000 (lb/ton)*

APPENDIX B. SOURCE INFORMATION

Appendix Table B-1. General Source Information

EU ID	Source Description	Current Ohio EPA Application Number	Installation Date (Month and Year)	Operating Schedule[a]
P002	No. 3 Seamless Q & T Austenitizing Furnace	A0066166	3/2003	24/7/52
P036	No. 3 Seamless Mill No. 1 Reheat Furnace		6/1930	24/7/52
P049	Small OD Product Austenitizing Furnace		7/2011	24/7/52
P050	Small OD Product Tempering Furnace		7/2011	24/7/52

a. The Lorain Facility has been idle since mid-2020.

Appendix Table B-2. Control Equipment Information

OEPA Emission Unit ID	Control Equipment	Control Equipment Installation Date	Model Number	NOx Concentration (ppm)[a]	NOx Emission Rate (lb/MMBtu)[a]
P002	Low NOx Burners	2003	Bloom 1480-045 (Qty 16) Bloom 1480-020 (Qty 16)	47.57	0.071
P049	Low NOx Burners	2012	Bloom 1480-045 (Qty 16) Bloom 1480-020 (Qty 16)	52.50	0.06
P050	Low NOx Burners	2012	Bloom 1600-060 (Qty 4) Bloom 1480-040 (Qty 4) Bloom 1480-030 (Qty 4)	23.50	0.037

a. The NOx concentrations (ppm) and emission rates (lb/MMBtu) are based on the stack test results provided in Appendix D.

Appendix Table B-3. Average and Maximum Daily and Annual Production Rates for P002 and P036[a]

OEPA Emission Unit ID	Average Daily Production Rates (tons per day)			Maximum Daily Production Rates (tons per day)			Annual Production Rates (tons per year)		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
P002	252.50	389.51	226.29	703	778	597	92,126	97,302	24,892
P036	13.91	15.12	9.14	703	778	597	5,077	3,779	1,005

a. Per OAC 3745-110-03(J)(1), production rates are to be provided for each of the three full calendar years preceding the effective date of the rule. As previously noted, the facility has been fully idled since mid-2020 and did not operate at all in this three-year window. Therefore, 2018-2020 were used in this table, as they were the most recent preceding three-year period with operations for P002 and P036.

Appendix Table B-4. Average and Maximum Daily and Annual Production Rates for P049 and P050[a]

OEPA Emission Unit ID	Average Daily Production Rates (tons per day)			Maximum Daily Production Rates (tons per day)			Annual Production Rates (tons per year)		
	2013	2014	2015	2013	2014	2015	2013	2014	2015
P049	188.88	299.76	70.31	738	929	534	68,941	109,414	8,437
P050	188.88	292.66	66.85	738	929	534	68,491	106,820	8,022

a. Per OAC 3745-110-03(J)(1), production rates are to be provided for each of the three full calendar years preceding the effective date of the rule. As previously noted, the facility has been fully idled since mid-2020 and did not operate at all in this three-year window. Therefore, 2013-2015 were used in this table, as they were the most recent preceding three-year period with operations for P049 and P050.

Appendix Table B-5. Average Daily, Maximum Daily, and Annual NOx Emissions

OEPA Emission Unit ID	Average Daily NOx Emissions (lb/day)	Maximum Daily NOx Emissions (lb/day)	Annual NOx Emissions (tpy)
P002	73.05	146.02	9.13
P036	20.11	40.42	2.51
P049	17.72	54.90	3.23
P050	6.39	20.29	1.17

a. Per OAC 3745-110-03(J)(1)(g), emissions information should be based on the three calendar years preceding the effective date of the rule, or any other year that may be representative. Given that P002 and P036 did not operate in 2021, 2018-2020 were used to determine maximum emissions. P049 and P050 did not operate 2018-2020, therefore the emissions presented in this table for those units are based on year corresponding to the maximum emissions from 2013-2021 (i.e., 2014).

Appendix Figure B-1. Plot Plan

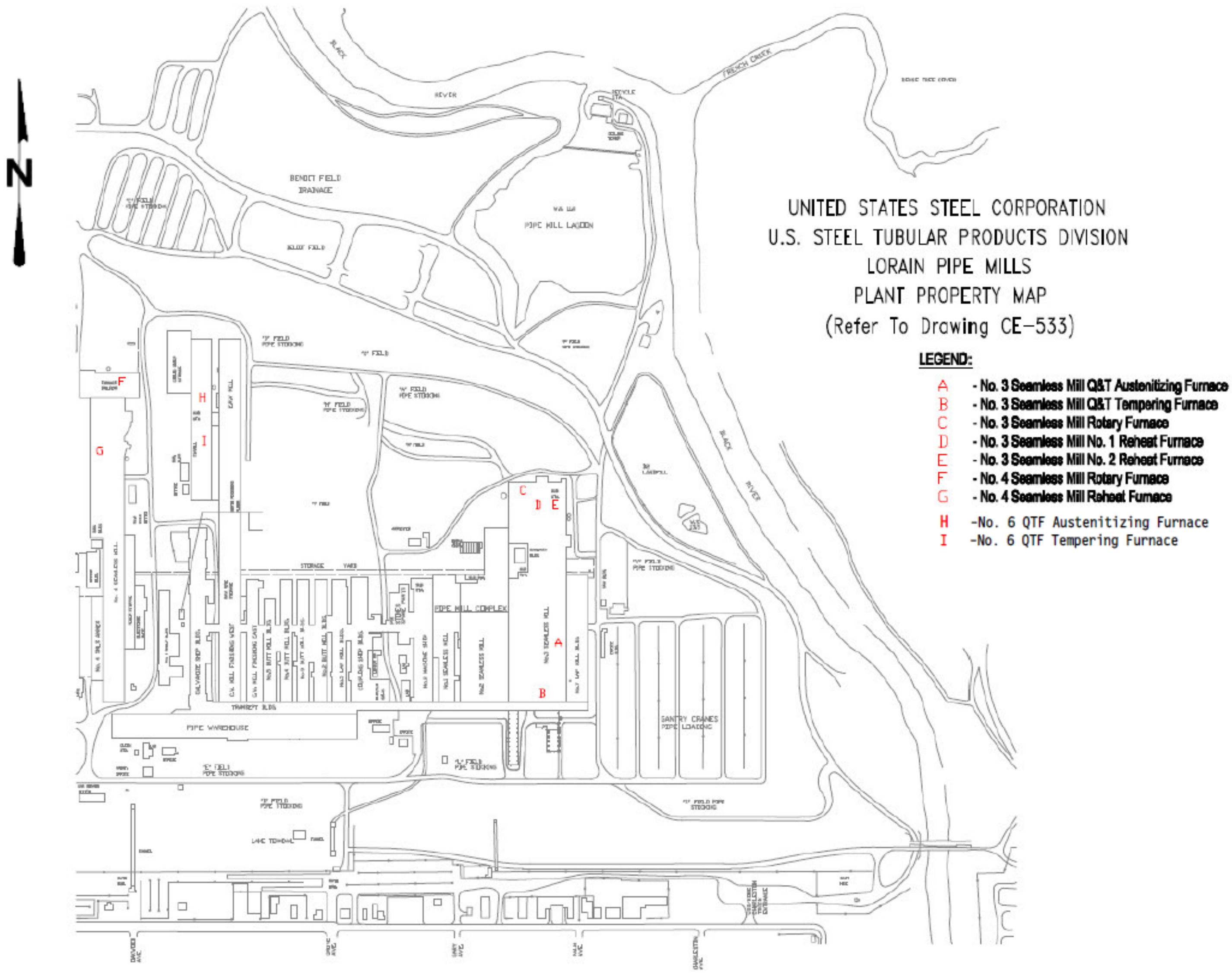


Figure 1-1. Locations of Furnaces at Lorain Pipe Mills

APPENDIX C. COST CALCULATIONS

At the request of the vendor (Tenova), pricing for the installation of low NOx burners has been removed from the public version of this document. Please refer to the confidential version for the detailed vendor quote including pricing and the cost effectiveness calculations associated with the installation of low NOx burners.

APPENDIX D. STACK TESTS

NO_x COMPLIANCE
TEST REPORT
FOR
US STEEL
LORAIN TUBULAR OPERATIONS
P002 - AUSTENITIZING FURNACE
LORAIN, OH
February 20, 2013

Job # 13-050

Test Report Date: 3-15-13

Grace Consulting, Inc.
Emissions Testing Services

March 15, 2013

I, Hal Stiles, hereby certify that the data obtained for US Steel - Lorain Tubular Operations on the Austenitizing Furnace in Lorain, Ohio are in accordance with procedures set forth by the USEPA. This report accurately represents the data obtained from the testing procedures and analysis of this data.

Hal Stiles, QSTI
Crew Chief

I, Carl Vineyard, hereby certify that I have reviewed this report and to the best of my knowledge, the data presented herein is complete and accurate.

Carl Vineyard, P.E., QSTI
Test Engineer

Grace Consulting, Inc.
P.O. Box 58
510 Dickson St.
Wellington, OH 44090

Toll Free: 1-877-GCI-TEST
Phone: 440-647-6672
Fax: 440-647-6673
gcitest.com

INTRODUCTION

INTRODUCTION

This report presents the results of the emissions tests performed for US Steel – Lorain Tubular Operations on the Austenitizing Furnace in Lorain, Ohio.

The purpose of the tests was to determine the emissions of the unit for compliance. The results can be found in the Summary of Test Results section of this report.

The testing was performed by Grace Consulting, Inc., located at 510 Dickson Street, Wellington, OH 44090. Present during the testing were Hal Stiles, Jacob Barker, Dan Kopronica and Bret Colombo from Grace Consulting, Inc. Karen Bezoski was present from US Steel - Lorain Tubular Operations. Tony Becker and Kristen Switzer were present from the Ohio EPA.

The tests were performed on February 20, 2013. The testing was completed in accordance with USEPA test methods as published in the July 1, 2012 Federal Register, - "Standards of Performance for New Stationary Sources" and subsequent revisions.

The sampling and analytical procedures can be found in the Sampling and Analytical Procedures section of this report. The raw field data and the equations used to determine the final results are presented in the Appendix section.

SUMMARY OF TEST RESULTS

SUMMARY OF TEST RESULTS

The following presents the results of the emissions tests performed for US Steel - Lorain Tubular Operations on the Austenitizing Furnace in Lorain, Ohio.

GASEOUS EMISSIONS

Run #	Description	Test Date	NO_x ppm	NO_x lb/mmBtu	O_2 %
1	Austenitizing Furnace	2-20-13	46.30	0.072	6.90
2	Austenitizing Furnace	2-20-13	47.10	0.075	7.20
3	Austenitizing Furnace	2-20-13	49.30	0.065	4.30
AVG.			**47.57**	**0.071**	**6.13**

NOx CONVERTER EFFICIENCY

		NO_2 Gas Value	Recorded Value	Converter Efficiency %
2-20-13	NO_2	43.52	42.92	98.62%

The complete results can be found on the computer printouts following.

Grace Consulting, Inc.

Sampling System Bias Check and Measured Value Correction

Lorain Tubular
Austentizing Furnace

Date: 2/20/2013
Pollutant: NOx
Monitor Span: 102.6

Run Number	Average Measured Value	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Corrected Value, Dry Basis
1	43.01	0.20	0.23	0.03	46.90	44.96	-1.89	49.43	46.30
2	42.83	0.23	0.43	0.19	44.96	44.84	-0.12	49.43	47.10
3	46.02	0.43	0.49	0.06	44.84	47.36	2.46	49.43	49.30

$$C_{gas} = (C_{avg} - C_o) * C_{ma} / (C_m - C_o) \qquad \text{Eq. 6C-1}$$

where:

Cgas = Effluent gas concentration, dry basis, ppm
Cavg = Average gas concentration indicated by gas analyzer, dry basis, ppm
Co = Average of initial and final system calibration bias check responses for the zero gas, ppm
Cm = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm
Cma = Actual concentration of the upscale calibration gas, ppm

Grace Consulting, Inc.

Sampling System Bias Check and Measured Value Correction

Lorain Tubular
Austentizing Furnace

Date:	2/20/2013
Pollutant:	O2
Monitor Span:	21.96

Run Number	Average Measured Percent	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Corrected Percent, Dry Basis
1	6.89	0.30	0.16	-0.64	11.19	10.84	-1.59	11.13	6.90
2	7.06	0.16	0.14	-0.09	10.84	10.86	0.09	11.13	7.20
3	4.29	0.14	0.12	-0.09	10.86	10.87	0.05	11.13	4.30

Cgas = (Cavg - Co) * Cma / (Cm - Co)   Eq. 6C-1

where:

Cgas = Effluent gas concentration, dry basis, percent
Cavg = Average gas concentration indicated by gas analyzer, dry basis, percent
Co = Average of initial and final system calibration bias check responses for the zero gas, percent
Cm = Average of initial and final system calibration bias check responses for the upscale calibration gas, percent
Cma = Actual concentration of the upscale calibration gas, percent

SAMPLING AND ANALYTICAL PROCEDURES

Test Methods used at US Steel, Lorain Tubular – Austenitizing Furnace

Method 3A

CO_2 and O_2 concentrations were determined with 3 Method 3A test runs. The sampling was performed at 3-points. GCI used a monitor range of 0-21.96% for O_2.

Method 7E

NO_x concentrations were determined with 3 Method 7E test runs. The sampling was performed at 3-points. GCI used a monitor span of 102.6 ppm for NO_x.

APPENDIX

Sample Calculations

NO_x CALCULATION
(O_2 Based)

Eq. 19-1

lb/dscf = $1.194 \times 10^{-7} \times$ PPM

lb/mmBtu = lb/dscf x f-factor x $\frac{20.9}{20.9 - \%O_2}$

SAMPLING SYSTEM BIAS CORRECTION

EMISSION CALCULATION
(CFR 40, Part 60, Appendix A)

Eq. 6C-1

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

Where:

C_{gas} = Effluent gas concentration, dry basis, ppm.
$\bar{C}$ = Average gas concentration indicated by gas analyzer, dry basis, ppm.
C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm.
C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm.
C_{ma} = Actual concentration of the upscale calibration gas, ppm.

Test Data Sheets

Client	Lorain Tubular	Project #	13-050.1	Date	2/20/2013
Unit	Austenitizing Furnace	Load	High	Operator	Stiles
Plant	P002		***Run 1***		

	Time	O2%	NOx
1	11:40:37	6.59	43.44
2	11:41:37	6.50	44.17
3	11:42:37	5.99	45.05
4	11:43:37	5.92	45.42
5	11:44:37	5.95	45.61
6	11:45:37	6.05	46.11
7	11:46:37	6.44	44.63
8	11:47:37	6.78	45.18
9	11:48:37	6.86	45.00
10	11:49:37	6.26	45.77
11	11:50:37	5.80	45.49
12	11:51:37	5.76	45.43
13	11:52:37	5.68	45.10
14	11:53:37	6.02	44.90
15	11:54:37	6.52	44.56
16	11:55:37	6.37	44.45
17	11:56:37	6.79	43.26
18	11:57:37	7.38	41.73
19	11:58:37	7.98	40.28
20	11:59:37	8.13	40.17
21	12:00:37	8.35	39.53
22	12:01:37	8.05	40.59
23	12:02:37	8.56	39.62
24	12:03:37	8.45	40.02
25	12:04:37	8.90	39.14
26	12:05:37	8.73	39.81
27	12:06:37	9.29	38.44
28	12:07:37	9.10	39.39
29	12:08:37	9.01	40.11
30	12:09:37	8.92	39.92
31	12:10:37	8.59	41.01
32	12:11:37	8.80	40.52
33	12:12:37	8.32	40.52
34	12:13:37	8.57	40.86
35	12:14:37	8.90	40.27
36	12:15:37	8.51	39.77
37	12:16:37	8.65	40.03
38	12:17:37	8.07	40.83
39	12:18:37	8.39	41.34
40	12:19:37	8.15	41.81
41	12:20:37	7.70	43.23
42	12:21:37	7.10	43.96
43	12:22:37	6.73	44.76
44	12:23:37	6.22	45.35
45	12:24:37	5.77	46.09
46	12:25:37	5.21	46.82
47	12:26:37	5.11	45.85
48	12:27:37	5.17	45.39

49	12:28:37	5.25	44.28
50	12:29:37	4.81	44.92
51	12:30:37	4.94	44.41
52	12:31:37	5.70	42.94
53	12:32:37	5.53	43.32
54	12:33:37	5.83	42.39
55	12:34:37	5.09	44.13
56	12:35:37	5.22	44.19
57	12:36:37	5.25	44.67
58	12:37:37	5.14	44.82
59	12:38:37	5.52	44.66
60	12:39:37	5.26	44.87
61	12:40:37	5.83	43.43
	Average	**6.89**	**43.01**

Client	Lorain Tubular	Project #	13-050.1	Date	2/20/2013
Unit	Austenitizing Furnace	Load	High	Operator	Stiles
Plant	P002				

Run 2

	Time	O2%	NOx
1	13:00:37	8.57	41.67
2	13:01:37	8.64	41.52
3	13:02:37	8.75	41.87
4	13:03:37	9.13	40.77
5	13:04:37	9.26	40.59
6	13:05:37	8.95	41.16
7	13:06:37	9.23	41.13
8	13:07:37	9.17	40.32
9	13:08:37	9.17	40.96
10	13:09:37	9.40	40.01
11	13:10:37	9.26	40.88
12	13:11:37	9.31	40.20
13	13:12:37	9.32	40.45
14	13:13:37	9.19	40.22
15	13:14:37	9.17	40.36
16	13:15:37	9.45	40.85
17	13:16:37	9.20	40.27
18	13:17:37	9.28	40.79
19	13:18:37	9.28	40.56
20	13:19:37	9.04	41.64
21	13:20:37	9.80	39.40
22	13:21:37	9.79	39.22
23	13:22:37	9.53	40.71
24	13:23:37	8.97	41.78
25	13:24:37	9.03	42.33
26	13:25:37	9.27	40.14
27	13:26:37	9.12	40.02
28	13:27:37	8.23	41.56
29	13:28:37	7.92	42.53
30	13:29:37	7.26	43.23
31	13:30:37	6.50	44.66
32	13:31:37	6.15	46.14
33	13:32:37	5.85	45.08
34	13:33:37	5.57	45.07
35	13:34:37	5.04	45.88
36	13:35:37	4.97	45.49
37	13:36:37	4.56	45.52
38	13:37:37	4.82	44.73
39	13:38:37	4.47	44.77
40	13:39:37	4.30	45.02
41	13:40:37	5.11	43.94
42	13:41:37	5.94	42.22
43	13:42:37	5.68	42.93
44	13:43:37	5.66	42.75
45	13:44:37	5.30	44.22
46	13:45:37	5.16	44.39
47	13:46:37	4.98	44.84

48	13:47:37	5.23	45.09
49	13:48:37	4.91	45.58
50	13:49:37	4.73	45.00
51	13:50:37	4.84	45.42
52	13:51:37	4.74	45.35
53	13:52:37	4.68	44.98
54	13:53:37	4.38	45.68
55	13:54:37	4.86	44.98
56	13:55:37	4.63	45.03
57	13:56:37	4.88	44.96
58	13:57:37	4.62	44.51
59	13:58:37	4.74	44.19
60	13:59:37	4.59	44.49
	Average	**7.06**	**42.83**

Client	Lorain Tubular	Project #	13-050.1	Date	2/20/2013
Unit	Austenitizing Furnace	Load	High	Operator	Stiles
Plant	P002				

Run 3

	Time	O2%	NOx
1	14:23:37	4.04	43.67
2	14:24:37	5.17	43.47
3	14:25:37	4.60	45.34
4	14:26:37	4.43	45.16
5	14:27:37	3.81	43.60
6	14:28:37	3.26	44.80
7	14:29:37	3.65	44.86
8	14:30:37	3.45	45.05
9	14:31:37	3.47	45.04
10	14:32:37	3.87	44.82
11	14:33:37	4.20	45.96
12	14:34:37	3.98	47.19
13	14:35:37	4.05	47.20
14	14:36:37	3.56	47.36
15	14:37:37	3.49	47.69
16	14:38:37	4.36	46.23
17	14:39:37	4.56	44.65
18	14:40:37	4.59	45.73
19	14:41:37	5.04	45.81
20	14:42:37	4.99	46.15
21	14:43:37	5.58	45.50
22	14:44:37	4.92	47.27
23	14:45:37	5.20	47.79
24	14:46:37	5.22	46.80
25	14:47:37	5.28	47.28
26	14:48:37	5.38	46.89
27	14:49:37	5.48	46.40
28	14:50:37	5.43	46.47
29	14:51:37	5.10	46.60
30	14:52:37	4.84	46.90
31	14:53:37	4.87	46.11
32	14:54:37	4.55	46.19
33	14:55:37	5.15	45.15
34	14:56:37	5.14	45.08
35	14:57:37	4.85	45.25
36	14:58:37	4.34	45.43
37	14:59:37	4.90	44.55
38	15:00:37	4.82	44.99
39	15:01:37	4.28	46.15
40	15:02:37	3.87	47.40
41	15:03:37	3.59	47.38
42	15:04:37	4.23	45.68
43	15:05:37	3.97	46.06
44	15:06:37	3.98	46.05
45	15:07:37	3.88	45.44
46	15:08:37	3.66	46.04
47	15:09:37	3.84	46.81

48	15:10:37	3.63	47.02
49	15:11:37	3.44	46.75
50	15:12:37	3.30	46.72
51	15:13:37	3.24	46.52
52	15:14:37	4.13	45.95
53	15:15:37	3.97	46.11
54	15:16:37	3.40	46.74
55	15:17:37	3.43	47.13
56	15:18:37	3.52	46.67
57	15:19:37	3.92	46.73
58	15:20:37	4.59	45.79
59	15:21:37	4.30	46.07
60	15:22:37	4.01	46.15
61	15:23:37	4.10	45.21
	Average	**4.29**	**46.02**

GCI Calibration Data

Client	Lorain Tubular	Test Date	2/20/2013
	P002	Project #	13-050.1
Source Identification	Austenitizing Furnace	Operator	Stiles

Calibration Data For Sampling Runs: 1-3 Gas Type: NOx Span: 102.60	Cylinder Number	Cylinder Value % or PPM	Analyzer Response	Absolute Difference % or PPM	Difference % of Span	
Zero Gas	CC458271	**0.00**	-0.03	0.03	0.029	
No2 to No Converter Check	CC422282	**43.52**	42.92	0.602	98.62%	**PASS**
Mid-Range Gas	CC175354	**49.43**	49.32	0.11	0.107	
High-Range Gas	XC024822B	**102.60**	101.97	0.63	0.614	

Run #: 1 Gas Type: NOx Span: 102.6	Analyzer Response	Initial Values		Final Values		Drift % of Span
		System Response	System Cal. Bias % of Span	System Response	System Cal. Bias % of Span	
Zero Gas	-0.03	0.20	0.22	0.23	0.25	0.03
Upscale Gas	49.32	46.90	-2.36	44.96	-4.25	-1.89

Run #: 2 Gas Type: NOx Span: 102.6	Analyzer Response	Initial Values		Final Values		Drift % of Span
		System Response	System Cal. Bias % of Span	System Response	System Cal. Bias % of Span	
Zero Gas	-0.03	0.23	0.25	0.43	0.45	0.19
Upscale Gas	49.32	44.96	-4.25	44.84	-4.37	-0.12

Run #: 3 Gas Type: NOx Span: 102.6	Analyzer Response	Initial Values		Final Values		Drift % of Span
		System Response	System Cal. Bias % of Span	System Response	System Cal. Bias % of Span	
Zero Gas	-0.03	0.43	0.45	0.49	0.51	0.06
Upscale Gas	49.32	44.84	-4.37	47.36	-1.91	2.46

Client	Lorain Tubular	Test Date	2/20/2013
	P002	Project #	13-050.1
Source Identification	Austenitizing Furnace	Operator	Stiles

Calibration Data For Sampling Runs: 1-3 Gas Type: O2 Span: 21.96	Cylinder Number	Cylinder Value % or PPM	Analyzer Response	Absolute Difference % or PPM	Difference % of Span	
Zero Gas	CC175354	**0.00**	0.10	0.10	0.455	
Low-Range Gas						
Mid-Range Gas	CC458271	**11.13**	11.09	0.04	0.182	
High-Range Gas	CC305343	**21.96**	21.97	0.01	0.046	

Run #: 1 Gas Type: O2 Span: 21.96	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	0.10	0.30	0.91	0.16	0.27	-0.64
Upscale Gas	11.09	11.19	0.46	10.84	-1.14	-1.59

Run #: 2 Gas Type: O2 Span: 21.96	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	0.10	0.16	0.27	0.14	0.18	-0.09
Upscale Gas	11.09	10.84	-1.14	10.86	-1.05	0.09

Run #: 3 Gas Type: O2 Span: 21.96	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	0.10	0.14	0.18	0.12	0.09	-0.09
Upscale Gas	11.09	10.86	-1.05	10.87	-1.00	0.05

Calibration Gas Certification Sheets

Airgas

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0060	Reference Number:	54-124346290-1
Cylinder Number:	CC422282	Cylinder Volume:	129.3 Cubic Feet
Laboratory:	ASG - Chicago - IL	Cylinder Pressure:	2016 PSIG
PGVP Number:	B12012	Valve Outlet:	660
Gas Code:	NO2	Analysis Date:	Dec 06, 2012

Expiration Date: Dec 06, 2015

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NITROGEN DIOXIDE	44.00 PPM	45.62 PPM	G1	+/- 2%
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
GMIS/NO2	1242330811	CC283961	38.95 PPM NITROGEN DIOXIDE/NITROGEN	Apr 30, 2014
PRM	12014	726026	50.0 PPM NITROGEN DIOXIDE/NITROGEN	Mar 15, 2013

The SRM or PRM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
(CH-3) ECO PHYSICS CLD822S	Chemiluminescence	Nov 19, 2012

Triad Data Available Upon Request

Permanent Notes:OXYGEN ADDED TO MAINTAIN STABILITY

Notes:

Approved for Release

2801

Airgas

Airgas USA, LLC
2009 Bellaire Ave.
Royal Oak, MI 48067-6030
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Customer:	OAKWOOD		
Part Number:	E02NI99E15A0147	Reference Number:	32-400065067-1
Cylinder Number:	CC175354	Cylinder Volume:	144 Cu.Ft.
Laboratory:	MIC - Royal Oak-32 (SAF) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52012	Valve Outlet:	660
Gas Code:	NO	Analysis Date:	May 08, 2012

Expiration Date: May 08, 2014

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig, i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NITRIC OXIDE	50.00 PPM	49.16 PPM	G1	+/- 1% NIST Traceable
NITROGEN	Balance			

Total oxides of nitrogen 49.43 PPM For Reference Only

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	120602	CC233960	49.95PPM NITRIC OXIDE/NITROGEN	Dec 16, 2017

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
S/N 54, 100ppmFS NO, Nicolet 6700	Fourier Transform Infrared (FTIR)	Apr 18, 2012

Triad Data Available Upon Request

Notes:

ATM

Approved for Release

Airgas

Airgas USA, LLC
2009 Bellaire Ave.
Royal Oak, MI [illegible]
[illegible]
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Customer:	Oakwood		
Part Number:	E02NI99E15A3615	Reference Number:	32-400099628-1
Cylinder Number:	XC024622B	Cylinder Volume:	144 Cu.Ft.
Laboratory:	MIC - Royal Oak-32 (SAP) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B32012	Valve Outlet:	660
Gas Code:	NO	Analysis Date:	Oct 15, 2012

Expiration Date: Oct 15, 2020

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NITRIC OXIDE	100.0 PPM	102.3 PPM	G1	+/- 1% NIST Traceable
NITROGEN	Balance			
Total oxides of nitrogen		102.6 PPM		For Reference Only

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	1108058	CC332167	101.2PPM NITRIC OXIDE/NITROGEN	Feb 18, 2017

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
S/N 54, 100ppmFS NO, Nicolet 6700	Fourier Transform Infrared (FTIR)	Oct 05, 2012

Triad Data Available Upon Request

Notes:

Approved for Release

2777

Airgas

Airgas USA, LLC
2009 Bellaire Ave.
Royal Oak, MI 48067-8020
248-399-8020
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Customer:	Oakwood		
Part Number:	E03NI78E15A42E4	Reference Number:	32-400066435-1
Cylinder Number:	CC458271	Cylinder Volume:	151 Cu.Ft.
Laboratory:	MIC - Royal Oak-32 (SAP) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B62012	Valve Outlet:	590
Gas Code:	OC2	Analysis Date:	Jun 20, 2012

Expiration Date: Jun 20, 2015

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.I.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
CARBON DIOXIDE	10.50 %	10.69 %	G1	+/- 1% NIST Traceable
OXYGEN	11.00 %	11.13 %	G1	+/- 1% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	09060636	CC263068	9.921% CARBON DIOXIDE/NITROGEN	Apr 10, 2013
NTRM	980509	SG9168307BAL	16.04% OXYGEN/NITROGEN	Dec 01, 2015

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
E/N 54, 10% CO2, Nicolet 6700	Fourier Transform Infrared (FTIR)	Jun 07, 2012
E/N 51, 25%FS O2, Rosemont 755R	Paramagnetic (Para)	May 21, 2012

Triad Data Available Upon Request

Notes:

Approved for Release

Airgas

Airgas Great Lakes
2009 Bellaire Ave.
Royal Oak, MI 48067-8020
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Customer:	OAKWOOD		
Part Number:	E03NI58E15A0001	Reference Number:	32-400024405-1
Cylinder Number:	CC305343	Cylinder Volume:	159 Cu.Ft.
Laboratory:	MIC - Royal Oak-32 (SAP) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B62011	Valve Outlet:	590
		Analysis Date:	Oct 19, 2011

Expiration Date: Oct 19, 2014

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
CARBON DIOXIDE	19.50 %	20.21 %	G1	+/- 1% NIST Traceable
OXYGEN	22.00 %	21.96 %	G1	+/- 1% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	6060823	CC207967	22.51% OXYGEN/NITROGEN	May 01, 2016
NTRM	08061311	CC254763	20.09% CARBON DIOXIDE/NITROGEN	Jul 15, 2012

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
E/N 54, 20% FS CO2, Nicolet 6700	Fourier Transform Infrared (FTIR)	Sep 30, 2011
E/N 51, 25%FS O2, Rosemont 755R	Paramagnetic (Para)	Sep 22, 2011

Triad Data Available Upon Request

Notes:

A. F. Muhammad

Approved for Release

2601

Accreditation

STACK TESTING ACCREDITATION COUNCIL 500 W. Wood St., Palatine, IL 60067, director@betterdata.org

February 27, 2012

Mr. Tyson Stiles
Grace Consulting, Inc.
510 Dickson Street
Wellington, Ohio 44090

VIA E-mail

Dear Mr. Stiles,

On behalf of the STAC Board of Directors, I am pleased to inform you that Grace Consulting has been granted interim accreditation by the Stack Testing Accreditation Council (STAC). After careful review of your Quality System documentation and procedures, STAC has determined that they are in conformance with ASTM D7036-04 "Standard Practice for the Competency of Air Emission Testing Bodies". Final accreditation is contingent upon successful completion of your field audit. Please see Module 3 of STAC policy documentation for scheduling requirements.

During this period of interim accreditation, Grace Consulting may not claim to be a STAC accredited organization although you may refer to your interim status. To achieve final accreditation requires evidence that your Quality System is effectively implemented in your organization as determined by the field assessment. You may claim that your Quality System meets ASTM D7036 requirements.

Please note that the Attestation of Compliance you signed as part of your application for accreditation requires Grace Consulting to be in continuous compliance with the provisions of ASTM D7036. You are also required to comply with all relevant STAC policies and procedures. I encourage you to review this information.

If you have any questions, please feel free to contact me at 847-654-4569. Thank you for your participation in the STAC process and congratulations.

Yours truly,

Scott Evans
Stack Testing Accreditation Council

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

HAROLD E. STILES

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 3RD DAY OF FEBRUARY 2009 AND EFFECTIVE UNTIL FEBRUARY 2ND, 2014

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills, QSTI/QSTO Review Board

APPLICATION
NO.
2009-286

SOURCE EVALUATION SOCIETY

SES

Qualified Source Testing Individual

LET IT BE KNOWN THAT

HAROLD E. STILES

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS

ISSUED THIS 3RD DAY OF FEBRUARY 2009 AND EFFECTIVE UNTIL FEBRUARY 2ND, 2014

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills, QSTI/QSTO Review Board

APPLICATION
NO.
2009-286

NO_x COMPLIANCE TEST REPORT FOR US STEEL LORAIN TUBULAR OPERATIONS P036 - #1 REHEAT FURNACE LORAIN, OH

March 28, 2013

Job # 13-104

Test Report Date: 4-17-13

Grace Consulting, Inc.
Emissions Testing Services

April 17, 2013

I, Hal Stiles, hereby certify that the data obtained for US Steel - Lorain Tubular Operations on the P036 #1 Reheat Furnace in Lorain, Ohio are in accordance with procedures set forth by the USEPA. This report accurately represents the data obtained from the testing procedures and analysis of this data.

Hal Stiles
Crew Chief

I, Carl Vineyard, hereby certify that I have reviewed this report and to the best of my knowledge, the data presented herein is complete and accurate.

Carl Vineyard, P.E., QSTI
Test Engineer

Grace Consulting, Inc.
P.O. Box 58
510 Dickson St.
Wellington, OH 44090

Toll Free: 1-877-GCI-TEST
Phone: 440-647-6672
Fax: 440-647-6673
gcitest.com

INTRODUCTION

INTRODUCTION

This report presents the results of the emissions tests performed for US Steel – Lorain Tubular Operations on the P036 #1 Reheat Furnace in Lorain, Ohio.

The purpose of the tests was to determine the emissions of the unit for compliance. The results can be found in the Summary of Test Results section of this report.

The testing was performed by Grace Consulting, Inc., located at 510 Dickson Street, Wellington, OH 44090. Present during the testing were Hal Stiles and Bret Colombo from Grace Consulting, Inc. Karen Bezoski was present from US Steel - Lorain Tubular Operations. Tony Becker was present from the Ohio EPA.

The tests were performed on March 28, 2013. The testing was completed in accordance with USEPA test methods as published in the July 1, 2012 Federal Register, - "Standards of Performance for New Stationary Sources" and subsequent revisions.

The sampling and analytical procedures can be found in the Sampling and Analytical Procedures section of this report. The raw field data and the equations used to determine the final results are presented in the Appendix section.

SUMMARY OF TEST RESULTS

SUMMARY OF TEST RESULTS

The following presents the results of the emissions tests performed for US Steel - Lorain Tubular Operations on the P036 #1 Reheat Furnace in Lorain, Ohio.

GASEOUS EMISSIONS

Run #	Description	Test Date	NO_x ppm	NO_x lb/mmBtu	O_2 %
1	P036 #1 Reheat	3-28-13	11.50	0.104	18.50
2	P036 #1 Reheat	3-28-13	11.70	0.098	18.30
3	P036 #1 Reheat	3-28-13	11.20	0.101	18.50
AVG.			**11.47**	**0.101**	**18.43**

STRATIFICATION

Date	Monitor	Point 1	Point 2	Point 3	Average	Greatest Deviation
3-28-13	NO_x	11.03	10.57	10.94	10.84	2.54%
	O_2	18.53	18.38	18.07	18.33	1.43%

NOx CONVERTER EFFICIENCY

		NO_2 Gas Value	Recorded Value	Converter Efficiency %
3-28-13	NO_x	43.52	41.53	95.43%

The complete results can be found on the computer printouts following.

Grace Consulting, Inc.

Sampling System Bias Check and Measured Value Correction

Lorain Tubular
P036 - Unit No.1 Reheat Stack

Date: 3/28/2013
Pollutant: NOx
Monitor Span: 99.04

Run Number	Average Measured Value	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Corrected Value, Dry Basis
1	10.84	0.46	-0.40	-0.87	47.40	46.20	-1.21	49.74	11.50
2	10.32	-0.40	-1.24	-0.85	46.20	46.80	0.61	49.74	11.70
3	9.66	-1.24	-0.61	0.64	46.80	45.30	-1.51	49.74	11.20

$$Cgas = (Cavg - Co) * Cma / (Cm - Co) \qquad \text{Eq. 6C-1}$$

where:

Cgas = Effluent gas concentration, dry basis, ppm
Cavg = Average gas concentration indicated by gas analyzer, dry basis, ppm
Co = Average of initial and final system calibration bias check responses for the zero gas, ppm
Cm = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm
Cma = Actual concentration of the upscale calibration gas, ppm

Grace Consulting, Inc.

Sampling System Bias Check and Measured Value Correction

Lorain Tubular
P036 - Unit No.1 Reheat Stack

Date: 3/28/2013
Pollutant: O2
Monitor Span: 21.96

Run Number	Average Measured Percent	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Corrected Percent, Dry Basis
1	18.33	0.11	0.00	-0.50	10.83	10.79	-0.18	10.87	18.50
2	18.15	0.00	0.05	0.23	10.79	10.75	-0.18	10.87	18.30
3	18.28	0.05	0.03	-0.09	10.75	10.77	0.09	10.87	18.50

Cgas = (Cavg - Co) * Cma / (Cm - Co)   Eq. 6C-1

where:
Cgas = Effluent gas concentration, dry basis, percent
Cavg = Average gas concentration indicated by gas analyzer, dry basis, percent
Co = Average of initial and final system calibration bias check responses for the zero gas, percent
Cm = Average of initial and final system calibration bias check responses for the upscale calibration gas, percent
Cma = Actual concentration of the upscale calibration gas, percent

SAMPLING AND ANALYTICAL PROCEDURES

Test Methods used at Lorain Tubular – P036, #1 Reheat Furnace

Method 3A

O_2 concentrations were determined with 3 Method 3A test runs. The sampling was performed at 3-points. GCI used a monitor range of 0 – 21.96% for O_2.

Method 7E

NO_x concentrations were determined with 3 Method 7E test runs. The sampling was performed at 3-points. GCI used a monitor span of 99.04 ppm for NO_x.

APPENDIX

Sample Calculations

NO_x CALCULATION
(O_2 Based)

lb/dscf $= 1.194 \times 10^{-7} \times \text{PPM}$

lb/mmBtu $= \text{lb/dscf} \times \text{f-factor} \times \dfrac{20.9}{20.9 - \%O_2}$

lb/hour $= \text{lb/dscf} \times \text{dscfm} \times 60 \text{ min./hr}$

SAMPLING SYSTEM BIAS CORRECTION

EMISSION CALCULATION
(CFR 40, Part 60, Appendix A)

Eq. 6C-1

$$C_{gas} = \left(\overline{C} - C_o\right)\frac{C_{ma}}{C_m - C_o}$$

Where:

C_{gas} = Effluent gas concentration, dry basis, ppm.
$\overline{C}$ = Average gas concentration indicated by gas analyzer, dry basis, ppm.
C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm.
C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm.
C_{ma} = Actual concentration of the upscale calibration gas, ppm.

Test Data Sheets

Client	Lorain Tubular	Project #	13-104	Date	3/28/2013
Unit	No.1 Reheat Stack	Load	normal	Operator	Stiles
Plant	P036				

Run 1

		Time	O_2 %	% Dev.	NOx	% Dev.
	1	8:50:10	18.11		12.93	
	2	8:51:10	18.22		12.96	
	3	8:52:10	18.50		12.13	
	4	8:53:10	18.50		11.34	
	5	8:54:10	18.53		11.00	
	6	8:55:10	18.56		11.01	
	7	8:56:10	18.47		10.96	
	8	8:57:10	18.36		11.10	
	9	8:58:10	18.56		11.54	
	10	8:59:10	18.60		11.27	
	11	9:00:10	18.65		10.67	
	12	9:01:10	18.69		10.37	
	13	9:02:10	18.68		10.22	
	14	9:03:10	18.66		10.17	
	15	9:04:10	18.64		10.44	
	16	9:05:10	18.66		10.53	
	17	9:06:10	18.64		10.53	
	18	9:07:10	18.59		10.32	
	19	9:08:10	18.47		10.44	
	20	9:09:10	18.52		10.57	
		Average	**18.53**	1.10%	**11.03**	1.68%
	21	9:10:10	18.55		10.72	
	22	9:11:10	18.60		10.41	
	23	9:12:10	18.56		10.34	
	24	9:13:10	18.70		10.24	
	25	9:14:10	18.67		10.07	
	26	9:15:10	18.50		10.25	
	27	9:16:10	18.55		10.93	
	28	9:17:10	18.75		11.07	
	29	9:18:10	18.88		10.35	
	30	9:19:10	18.85		9.59	
Pause	31	9:20:10	18.74		9.53	
plant equipment		9:21:10	18.64		10.06	
change		9:22:10	18.65		9.03	
		9:23:10	18.75		8.87	
		9:24:10	19.49		7.16	
		9:25:10	20.46		0.92	
		9:26:10	20.09		0.19	
		9:27:10	19.55		1.05	
		9:28:10	20.24		2.20	
		9:29:10	20.08		1.80	
		9:30:10	16.62		0.28	
		9:31:10	15.76		0.35	
		9:32:10	15.84		1.93	
		9:33:10	15.16		2.67	
		9:34:10	10.79		1.24	

9:35:10	15.28	1.76
9:36:10	19.12	5.77
9:37:10	19.91	4.73
9:38:10	19.93	2.63
9:39:10	19.08	1.98
9:40:10	19.09	3.75
9:41:10	19.83	4.66
9:42:10	19.80	3.07
9:43:10	19.24	2.08
9:44:10	19.21	3.56
9:45:10	19.64	4.62
9:46:10	19.67	3.79
9:47:10	19.37	3.12
9:48:10	19.35	3.41
9:49:10	19.57	3.85
9:50:10	19.50	3.54
9:51:10	19.35	3.50
9:52:10	19.51	4.04
9:53:10	19.63	3.91
9:54:10	19.59	3.29
9:55:10	19.42	3.22
9:56:10	19.40	3.64
9:57:10	19.39	4.03
9:58:10	19.48	3.99
9:59:10	19.62	3.66
10:00:10	19.62	3.43
10:01:10	19.50	3.30
10:02:10	19.46	3.50
10:03:10	19.40	3.89
10:04:10	19.48	3.97
10:05:10	19.52	3.79
10:06:10	19.46	3.58
10:07:10	19.39	3.64
10:08:10	19.44	3.93
10:09:10	19.62	3.98
10:10:10	19.68	3.57
10:11:10	19.56	3.34
10:12:10	19.54	3.37
10:13:10	19.13	3.70
10:14:10	18.54	4.94
10:15:10	18.28	7.30
10:16:10	18.35	9.06
10:17:10	18.42	9.48
10:18:10	18.36	9.41
10:19:10	18.26	9.58
10:20:10	18.40	9.90
10:21:10	18.60	9.76
10:22:10	18.64	9.14
10:23:10	18.46	8.66
10:24:10	17.94	9.40
10:25:10	17.75	11.16

		10:26:10	17.77	12.40
		10:27:10	17.82	12.77
		10:28:10	17.81	12.71
		10:29:10	17.77	12.59
		10:30:10	17.69	12.75
		10:31:10	17.72	12.95
		10:32:10	17.79	13.02
		10:33:10	17.86	12.84
		10:34:10	17.89	12.50
		10:35:10	17.90	12.48
		10:36:10	17.90	12.52
		10:37:10	17.89	12.36
		10:38:10	17.96	12.20
		10:39:10	17.97	12.04
		10:40:10	17.97	11.89
		10:41:10	17.94	11.99
		10:42:10	17.94	12.01
		10:43:10	17.93	12.11
		10:44:10	17.97	12.17
		10:45:10	17.94	12.12
		10:46:10	17.99	12.13
		10:47:10	17.95	12.11
		10:48:10	17.92	12.03
		10:49:10	18.03	12.15
		10:50:10	18.02	11.92
		10:51:10	18.09	11.62
		10:52:10	18.06	11.53
		10:53:10	18.07	11.39
		10:54:10	18.06	11.37
		10:55:10	18.13	11.32
		10:56:10	18.00	11.25
		10:57:10	17.94	11.67
		10:58:10	18.01	11.97
		10:59:10	17.94	11.96
		11:00:10	17.96	12.05
		11:01:10	18.06	11.89
		11:02:10	18.08	11.56
		11:03:10	18.12	11.24
		11:04:10	18.00	11.19
		11:05:10	17.95	11.55
		11:06:10	17.78	11.86
		11:07:10	17.81	12.27
		11:08:10	18.07	12.44
		11:09:10	18.24	11.50
resume	32	11:10:10	18.22	10.20
	33	11:11:10	18.07	9.80
	34	11:12:10	17.83	10.39
	35	11:13:10	17.87	11.46
	36	11:14:10	17.92	11.97
	37	11:15:10	18.02	11.85
	38	11:16:10	18.19	11.43
	39	11:17:10	18.20	10.52

40	11:18:10	17.84		10.23	
	Average	**18.38**	0.26%	**10.57**	-2.54%
41	11:19:10	17.89		11.19	
42	11:20:10	17.96		11.87	
43	11:21:10	18.04		11.68	
44	11:22:10	18.19		11.37	
45	11:23:10	18.21		10.60	
46	11:24:10	17.98		10.39	
47	11:25:10	17.99		10.88	
48	11:26:10	17.90		11.28	
49	11:27:10	18.01		11.44	
50	11:28:10	18.14		11.21	
51	11:29:10	18.17		10.31	
52	11:30:10	18.02		10.34	
53	11:31:10	18.04		10.92	
54	11:32:10	17.98		11.10	
55	11:33:10	17.98		11.22	
56	11:34:10	18.12		11.23	
57	11:35:10	18.25		10.64	
58	11:36:10	18.11		10.18	
59	11:37:10	18.12		10.35	
60	11:38:10	18.23		10.64	
	Average	**18.07**	-1.43%	**10.94**	0.91%
	Average	**18.33**		**10.84**	

Client	Lorain Tubular	Project #	13-104	Date	3/28/2013
Unit	No.1 Reheat Stack	Load	normal	Operator	Stiles
Plant	P036				

Run 2

		Time	**O_2 %**	**NOx**
	1	11:55:10	18.06	9.32
	2	11:56:10	18.15	9.64
	3	11:57:10	18.13	9.92
	4	11:58:10	18.20	10.05
	5	11:59:10	18.19	9.83
	6	12:00:10	17.96	10.01
	7	12:01:10	18.05	10.66
	8	12:02:10	18.18	10.88
	9	12:03:10	17.95	10.77
	10	12:04:10	18.05	11.00
	11	12:05:10	18.14	11.04
	12	12:06:10	18.01	10.75
	13	12:07:10	18.10	10.86
	14	12:08:10	18.22	10.66
	15	12:09:10	18.15	10.25
	16	12:10:10	18.22	10.26
	17	12:11:10	18.28	10.16
	18	12:12:10	18.04	10.14
	19	12:13:10	18.11	10.64
	20	12:14:10	18.11	10.78
	21	12:15:10	18.05	10.54
	22	12:16:10	18.13	10.77
	23	12:17:10	18.24	10.46
	24	12:18:10	18.10	10.01
	25	12:19:10	18.06	10.46
	26	12:20:10	18.05	10.96
	27	12:21:10	18.10	11.13
	28	12:22:10	18.29	10.73
	29	12:23:10	18.04	10.19
	30	12:24:10	18.08	10.58
pause	31	12:25:10	18.16	11.12
		12:26:10	18.18	10.88
		12:27:10	18.17	10.64
		12:28:10	18.24	10.61
		12:29:10	18.32	10.40
		12:30:10	18.27	10.01
		12:31:10	18.17	9.91
		12:32:10	18.18	10.26
		12:33:10	18.24	10.41
		12:34:10	18.20	10.32
		12:35:10	18.16	10.60
		12:36:10	18.21	10.78
resume	32	12:37:10	18.23	10.78
	33	12:38:10	18.13	10.42
	34	12:39:10	17.80	10.57

	35	12:40:10	17.81	11.62
	36	12:41:10	18.15	12.08
	37	12:42:10	18.40	10.74
	38	12:43:10	18.28	9.62
	39	12:44:10	18.20	9.39
	40	12:45:10	18.01	9.94
	41	12:46:10	18.06	10.77
	42	12:47:10	18.25	10.78
	43	12:48:10	18.21	10.31
	44	12:49:10	18.35	9.83
	45	12:50:10	18.32	9.48
	46	12:51:10	18.10	9.53
pause	47	12:52:10	18.15	10.42
		12:53:10	18.15	10.82
		12:54:10	18.05	10.80
		12:55:10	18.17	10.97
		12:56:10	18.15	10.78
		12:57:10	18.18	10.55
		12:58:10	18.26	10.45
		12:59:10	18.22	10.29
		13:00:10	18.27	10.37
		13:01:10	18.26	10.45
		13:02:10	18.25	10.46
		13:03:10	18.20	10.49
		13:04:10	18.14	10.54
		13:05:10	18.11	10.79
		13:06:10	18.15	10.95
		13:07:10	18.14	10.84
		13:08:10	18.11	11.02
		13:09:10	18.14	11.04
		13:10:10	18.13	11.00
		13:11:10	18.07	11.02
		13:12:10	17.99	10.87
		13:13:10	18.04	10.95
		13:14:10	18.21	10.75
		13:15:10	18.36	9.89
		13:16:10	18.11	9.60
		13:17:10	18.15	10.12
		13:18:10	18.31	10.53
		13:19:10	18.33	9.87
		13:20:10	18.20	9.48
		13:21:10	18.25	9.70
		13:22:10	18.23	9.99
		13:23:10	18.30	9.95
		13:24:10	18.26	9.89
		13:25:10	18.17	9.82
		13:26:10	18.01	10.34
		13:27:10	18.06	11.08
		13:28:10	18.15	10.92
		13:29:10	18.06	10.55
resume	48	13:30:10	18.19	10.51

49	13:31:10	18.21	10.33
50	13:32:10	18.27	10.10
51	13:33:10	18.37	9.85
52	13:34:10	18.23	9.36
53	13:35:10	18.16	9.51
54	13:36:10	18.21	9.90
55	13:37:10	18.21	9.99
56	13:38:10	18.30	9.99
57	13:39:10	18.38	9.68
58	13:40:10	18.29	9.36
59	13:41:10	18.16	9.44
60	13:42:10	17.92	10.20
Average		**18.15**	**10.32**

Client	Lorain Tubular	Project #	13-104	Date	3/28/2013
Unit	No.1 Reheat Stack	Load	normal	Operator	Stiles
Plant	P036				

Run 3

	Time	O_2 %	NOx
1	14:00:10	18.06	8.63
2	14:01:10	18.14	9.39
3	14:02:10	18.21	9.70
4	14:03:10	18.28	9.63
5	14:04:10	18.42	9.49
6	14:05:10	18.37	9.18
7	14:06:10	18.14	9.26
8	14:07:10	18.14	10.21
9	14:08:10	18.30	10.68
10	14:09:10	18.36	9.86
11	14:10:10	18.15	9.40
12	14:11:10	18.18	10.03
13	14:12:10	18.33	10.21
14	14:13:10	18.43	9.59
15	14:14:10	18.19	9.28
16	14:15:10	18.27	9.84
17	14:16:10	18.30	10.05
18	14:17:10	18.21	9.71
19	14:18:10	18.13	9.87
20	14:19:10	18.25	10.27
21	14:20:10	18.39	9.97
22	14:21:10	18.24	9.29
23	14:22:10	18.27	9.57
24	14:23:10	18.31	9.94
25	14:24:10	18.32	9.66
26	14:25:10	18.26	9.58
27	14:26:10	18.31	9.73
28	14:27:10	18.32	9.73
29	14:28:10	18.34	9.27
30	14:29:10	18.18	9.15
31	14:30:10	18.29	9.60
32	14:31:10	18.39	9.68
33	14:32:10	18.44	9.16
34	14:33:10	18.30	8.92
35	14:34:10	18.11	9.19
36	14:35:10	18.01	10.27
37	14:36:10	18.18	10.85
38	14:37:10	18.19	10.68
39	14:38:10	18.29	10.41
40	14:39:10	18.42	9.91
41	14:40:10	18.24	9.36
42	14:41:10	18.27	9.70
43	14:42:10	18.27	9.95
44	14:43:10	18.40	9.58
45	14:44:10	18.32	9.33

46	14:45:10	18.48	9.34
47	14:46:10	18.36	9.39
48	14:47:10	18.28	9.29
49	14:48:10	18.26	9.69
50	14:49:10	18.32	9.97
51	14:50:10	18.39	9.49
52	14:51:10	18.31	9.20
53	14:52:10	18.41	9.36
54	14:53:10	18.37	9.36
55	14:54:10	18.32	9.16
56	14:55:10	18.19	9.51
57	14:56:10	18.24	9.98
58	14:57:10	18.29	10.19
59	14:58:10	18.34	9.72
60	14:59:10	18.20	9.42
Average		**18.28**	**9.66**

GCI Calibration Data

Client	Lorain Tubular	Test Date	3/28/2013
	P036	Project #	13-104
Source Identification	No.1 Reheat Stack	Operator	Stiles

Calibration Data For Sampling Runs: 1-3 Gas Type: NOx Span: 99.04	Cylinder Number	Cylinder Value % or PPM	Analyzer Response	Absolute Difference % or PPM	Difference % of Span	
Zero Gas	EB0013280	**0.00**	0.19	0.19	0.192	
No2 to No Converter Check	CC422282	**43.52**	41.53	1.99	95.43%	**PASS**
Mid-Range Gas	CC5394	**49.74**	49.20	0.54	0.545	
High-Range Gas	CC39848	**99.04**	98.60	0.44	0.444	

Run #: 1 Gas Type: NOx Span: 99.04	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	0.19	0.46	0.27	-0.40	-0.60	-0.87
Upscale Gas	49.20	47.40	-1.82	46.20	-3.03	-1.21

Run #: 2 Gas Type: NOx Span: 99.04	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	0.19	-0.40	-0.60	-1.24	-1.44	-0.85
Upscale Gas	49.20	46.20	-3.03	46.80	-2.42	0.61

Run #: 3 Gas Type: NOx Span: 99.04	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	0.19	-1.24	-1.44	-0.61	-0.81	0.64
Upscale Gas	49.20	46.80	-2.42	45.30	-3.94	-1.51

Client	Lorain Tubular	Test Date	3/28/2013
	P036	Project #	13-104
Source Identification	No.1 Reheat Stack	Operator	Stiles

Calibration Data For Sampling Runs: 1-3 Gas Type: O2 Span: 21.96	Cylinder Number	Cylinder Value % or PPM	Analyzer Response	Absolute Difference % or PPM	Difference % of Span	
Zero Gas	EB0013280	**0.00**	0.06	0.06	0.273	
Low-Range Gas						
Mid-Range Gas	CC210696	**10.87**	10.98	0.11	0.501	
High-Range Gas	CC305343	**21.96**	22.04	0.08	0.364	

Run #: 1 Gas Type: O2 Span: 21.96	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	0.06	0.11	0.23	0.00	-0.27	-0.50
Upscale Gas	10.98	10.83	-0.68	10.79	-0.87	-0.18

Run #: 2 Gas Type: O2 Span: 21.96	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	0.06	0.00	-0.27	0.05	-0.05	0.23
Upscale Gas	10.98	10.79	-0.87	10.75	-1.05	-0.18

Run #: 3 Gas Type: O2 Span: 21.96	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	0.06	0.05	-0.05	0.03	-0.14	-0.09
Upscale Gas	10.98	10.75	-1.05	10.77	-0.96	0.09

Gas Certification Sheets

Airgas

Airgas Great Lakes
2009 Bellaire Ave.
Royal Oak, MI 48067
(248) 399-9150 Fax: (248) 584-2540
www.airgas.com

CERTIFICATE OF BATCH ANALYSIS

NITROGEN - CEM-CAL ZERO

Customer:	STOCK		
Part Number:	NI CZ15A	Reference Number:	32-112344607-1
Cylinder Analyzed:	EB0013280	Cylinder Volume:	142 Cubic Feet
Laboratory:	MIC - Royal Oak-32 - MI	Cylinder Pressure:	2000 PSIG
Analysis Date:	Aug 22, 2011	Valve Outlet:	580
Lot #:	32-112344607-1		

Expiration Date: Aug 22, 2016

ANALYTICAL RESULTS

Component	Requested Purity	Certified Concentration
NitrogenCEM	99.9995%	99.9995%
CARBON DIOXIDE	< 1.0 PPM	<LDL 0.122 PPM
Moisture	< 1.0 PPM	< 0.10 PPM
NOx	< 0.1 PPM	0.02 PPM
SO2	< 0.1 PPM	< 0.1 PPM
THC	< 0.1 PPM	<LDL 0.029 PPM
CARBON MONOXIDE	< 0.5 PPM	<LDL 0.122 PPM
Oxygen	< 0.5 PPM	0.27 PPM

Cylinders in Batch:

CC117850, CC1299202, CC149852, CC180270, CC182828, CC195514, CC210824, CC214627, CC230996, CC2621L, CC348967, CC42587, CC70587, CC71[illegible] EB0013280, SG9103861, SG9159289, SG9169372, XCO34311B

2624

Permanent Notes:

Product meets 40 CFR 1065 requirements

Notes:

Impurities verified against analytical standards traceable to NIST by weight and/or analysis.

A. F. Muhammad

Approved for Release

Airgas

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0060	Reference Number:	54-124346290-1
Cylinder Number:	CC422282	Cylinder Volume:	129.3 Cubic Feet
Laboratory:	ASG - Chicago - IL	Cylinder Pressure:	2016 PSIG
PGVP Number:	B12012	Valve Outlet:	660
Gas Code:	NO2	Analysis Date:	Dec 06, 2012

Expiration Date: Dec 06, 2015

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NITROGEN DIOXIDE	44.00 PPM	43.52 PPM	G1	+/- 2%
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
GMIS/NO2	1242336811	CC283981	59.95 PPM NITROGEN DIOXIDE/NITROGEN	Apr 30, 2014
PRM	12314	726635	50.0 PPM NITROGEN DIOXIDE/NITROGEN	Mar 15, 2013

The SRM or PRM noted above is only in reference to the GMIS used in the assay and not part of the analysis./

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
(CH-3) ECO PHYSICS CLD822S	Chemiluminescence	Nov 19, 2012

Triad Data Available Upon Request

Permanent Notes:OXYGEN ADDED TO MAINTAIN STABILITY

Notes:

Approved for Release

2801

Airgas

Airgas USA, LLC
2009 Bellaire Ave.
Royal Oak, MI 48067-8020
248-399-8020
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Customer:	OAKWOOD		
Part Number:	E02NI99E15A0147	Reference Number:	32-400077363-1
Cylinder Number:	CC5394	Cylinder Volume:	144 Cu.Ft.
Laboratory:	MIC - Royal Oak-32 (SAP) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B62012	Valve Outlet:	660
Gas Code:	NO	Analysis Date:	Aug 06, 2012

Expiration Date: Aug 06, 2014

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NITRIC OXIDE	50.00 PPM	49.74 PPM	G1	+/- 1% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	12060830	CC283850	49.95PPM NITRIC OXIDE/NITROGEN	Dec 16, 2017

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
E/N 54, 100ppmFS NO, Nicolet 6700	Fourier Transform Infrared (FTIR)	Jul 12, 2012

Triad Data Available Upon Request

Notes:

AFM

Approved for Release

2750

Airgas

Airgas Great Lakes
2009 Bellaire Ave.
Royal Oak, MI 48067-8020
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Customer:	Lansing		
Part Number:	E02NI99E15A3615	Reference Number:	32-400027958-1
Cylinder Number:	CC39848	Cylinder Volume:	144 Cu.Ft.
Laboratory:	MIC - Royal Oak-32 (SAP) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B62011	Valve Outlet:	660
		Analysis Date:	Nov 23, 2011

Expiration Date: Nov 23, 2013

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NITRIC OXIDE	100.0 PPM	98.77 PPM	G1	+/- 1% NIST Traceable
NITROGEN	Balance			
Total oxides of nitrogen		99.04 PPM		For Reference Only

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	11060521	CC331287	101.2PPM NITRIC OXIDE/NITROGEN	Feb 16, 2017

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
E/N 54, 100ppmFS NO, Nicolet 6700	Fourier Transform Infrared (FTIR)	Nov 11, 2011

Triad Data Available Upon Request

Notes:

Approved for Release

Airgas

Airgas USA, LLC
2009 Bellaire Ave.
Royal Oak, MI 48067-8020
248-399-8020
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Customer:	OAKWOOD		
Part Number:	E03NI78E15A42E4	Reference Number:	32-400099530-1
Cylinder Number:	CC210696	Cylinder Volume:	151 Cu.Ft.
Laboratory:	MIC - Royal Oak-32 (SAP) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B62012	Valve Outlet:	590
Gas Code:	OC2	Analysis Date:	Oct 09, 2012

Expiration Date: Oct 09, 2020

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
CARBON DIOXIDE	10.50 %	10.62 %	G1	+/- 1% NIST Traceable
OXYGEN	11.00 %	10.87 %	G1	+/- 1% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	09060225	CC263079	9.961% OXYGEN/NITROGEN	Jan 15, 2013
NTRM	120613	CC359993	11.002% CARBON DIOXIDE/NITROGEN	Jan 11, 2018

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
E/N 54, 10% CO2, Nicolet 6700	Fourier Transform Infrared (FTIR)	Sep 28, 2012
E/N 182 25% O2 FS, SIEMENS OXYMAT 6	Paramagnetic	Oct 05, 2012

Triad Data Available Upon Request

Notes:

AFM

Approved for Release

2783

Airgas

Airgas Great Lakes
2009 Bellaire Ave.
Royal Oak, MI 48067-8020
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Customer:	OAKWOOD		
Part Number:	E03NI58E15A0001	Reference Number:	32-400024405-1
Cylinder Number:	CC305343	Cylinder Volume:	159 Cu.Ft.
Laboratory:	MIC - Royal Oak-32 (SAP) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B62011	Valve Outlet:	590
		Analysis Date:	Oct 19, 2011

Expiration Date: Oct 19, 2014

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
CARBON DIOXIDE	19.50 %	20.21 %	G1	+/- 1% NIST Traceable
OXYGEN	22.00 %	21.96 %	G1	+/- 1% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	6060823	CC207967	22.51% OXYGEN/NITROGEN	May 01, 2016
NTRM	08061311	CC254763	20.09% CARBON DIOXIDE/NITROGEN	Jul 15, 2012

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
E/N 54, 20% FS CO2, Nicolet 6700	Fourier Transform Infrared (FTIR)	Sep 30, 2011
E/N 51, 25%FS O2, Rosemont 755R	Paramagnetic (Para)	Sep 22, 2011

Triad Data Available Upon Request

Notes:

A. F. Muhammad

Approved for Release

2601

Accreditation

STAC
STACK TESTING ACCREDITATION COUNCIL 500 W. Wood St., Palatine, IL 60067, director@betterdata.org

February 27, 2012

Mr. Tyson Stiles
Grace Consulting, Inc.
510 Dickson Street
Wellington, Ohio 44090

VIA E-mail

Dear Mr. Stiles,

On behalf of the STAC Board of Directors, I am pleased to inform you that Grace Consulting has been granted interim accreditation by the Stack Testing Accreditation Council (STAC). After careful review of your Quality System documentation and procedures, STAC has determined that they are in conformance with ASTM D7036-04 "Standard Practice for the Competency of Air Emission Testing Bodies". Final accreditation is contingent upon successful completion of your field audit. Please see Module 3 of STAC policy documentation for scheduling requirements.

During this period of interim accreditation, Grace Consulting may not claim to be a STAC accredited organization although you may refer to your interim status. To achieve final accreditation requires evidence that your Quality System is effectively implemented in your organization as determined by the field assessment. You may claim that your Quality System meets ASTM D7036 requirements.

Please note that the Attestation of Compliance you signed as part of your application for accreditation requires Grace Consulting to be in continuous compliance with the provisions of ASTM D7036. You are also required to comply with all relevant STAC policies and procedures. I encourage you to review this information.

If you have any questions, please feel free to contact me at 847-654-4569. Thank you for your participation in the STAC process and congratulations.

Yours truly,

Scott Evans
Stack Testing Accreditation Council

Dedicated to Continuous Improvement of Air Quality Measurement

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

HAROLD E. STILES

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 3RD DAY OF FEBRUARY 2009 AND EFFECTIVE UNTIL FEBRUARY 2ND, 2014

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills, QSTI/QSTO Review Board

APPLICATION NO. 2009-286

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

HAROLD E. STILES

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS

ISSUED THIS 3RD DAY OF FEBRUARY 2009 AND EFFECTIVE UNTIL FEBRUARY 2ND, 2014

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

APPLICATION NO. 2009-286

COMPLIANCE TEST REPORT FOR US STEEL LORAIN TUBULAR OPERATIONS AUSTENITIZING FURNACE & TEMPERING FURNACE

LORAIN, OH
December 9, 2011

Job # 11-412

Test Report Date: 12-30-11

INTRODUCTION

This report presents the results of the emissions tests performed for US Steel – Lorain Tubular Operations on the Austenitizing Furnace and Tempering Furnace, in Lorain, Ohio.

The purpose of the tests was to determine the emissions of the unit for compliance. The results can be found in the Summary of Test Results section of this report.

The testing was performed by Grace Consulting, Inc., located at 510 Dickson Street, Wellington, OH 44090. Present during the testing were Hal Stiles, Josh Nichols, Mark Howard, Dave Moody, Ricky Prosser and Bret Colombo from Grace Consulting, Inc. Kelly Cernanec was present from US Steel - Lorain Tubular Operations. Tony Becker was also present from the Ohio EPA.

The tests were performed on December 9, 2011. The testing was completed in accordance with USEPA test methods as published in the July 1, 2011 Federal Register, - "Standards of Performance for New Stationary Sources" and subsequent revisions.

The sampling and analytical procedures can be found in the Sampling and Analytical Procedures section of this report. The raw field data and the equations used to determine the final results are presented in the Appendix section.

SUMMARY OF TEST RESULTS

The following presents the results of the emissions tests performed for US Steel - Lorain Tubular Operations on the Austenitizing Furnace and Tempering Furnace, in Lorain, Ohio.

GASEOUS EMISSIONS

Run #	Description	Test Date	NO_x ppm	NO_x lb/mmBtu	NO_x lb/hr	O_2 %
1	Austenitizing Furnace	12-09-11	51.80	0.059	1.680	1.70
2	Austenitizing Furnace	12-09-11	53.50	0.063	1.734	2.50
3	Austenitizing Furnace	12-09-11	52.20	0.059	1.679	1.60
AVG.			**52.50**	**0.060**	**1.698**	**1.93**
1	Tempering Furnace	12-09-11	24.00	0.037	0.606	6.80
2	Tempering Furnace	12-09-11	23.10	0.037	0.772	7.20
3	Tempering Furnace	12-09-11	23.40	0.037	0.704	7.30
AVG.			**23.50**	**0.037**	**0.694**	**7.10**

STRATIFICATION

DATE		POINT 1	POINT 2	POINT 3	AVERAGE	GREATEST DEVIATION
Austenitizing Furance						
12-09-11	NO_x	52.40	51.80	50.80	51.66	1.70%
12-09-11	CO_2	10.60	10.70	10.80	10.68	0.86%
12-09-11	O_2	1.90	1.70	1.40	1.63	0.22%
Tempering Furance						
12-09-11	NO_x	24.53	24.64	24.31	24.49	0.76%
12-09-11	CO_2	8.34	8.35	8.41	8.36	0.56%
12-09-11	O_2	6.70	6.77	6.65	6.70	0.92%

NOx CONVERTER EFFICIENCY

		NO_2 GAS VALUE	RECORDED VALUE	CONVERTER EFFICIENCY %
12-09-11	NO_x	43.92	40.12	91.35%

The complete results can be found on the computer printouts following.

Grace Consulting, Inc.

Sampling System Bias Check and Measured Value Correction

US Steel
Lorain Tubular - Unit Austenitizing Furnace

Date: 12/9/2011
Pollutant: NOx
Monitor Span: 100.4

Run Number	Average Measured Value	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Percent Moisture	Corrected Value, Dry Basis	Corrected Value, Wet Basis
1	51.66	0.70	0.80	0.10	48.90	47.60	-1.29	48.32	18.40	51.80	42.30
2	52.21	0.80	0.50	-0.30	47.60	46.90	-0.70	48.32	18.60	53.50	43.50
3	50.82	0.50	0.60	0.10	46.90	47.30	0.40	48.32	19.40	52.20	42.10

$$C_{gas} = (C_{avg} - C_o) * C_{ma} / (C_m - C_o) \qquad \text{Eq. 6C-1}$$

where:

Cgas = Effluent gas concentration, dry basis, ppm
Cavg = Average gas concentration indicated by gas analyzer, dry basis, ppm
Co = Average of initial and final system calibration bias check responses for the zero gas, ppm
Cm = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm
Cma = Actual concentration of the upscale calibration gas, ppm

Grace Consulting, Inc.

Sampling System Bias Check and Measured Value Correction

US Steel
Lorain Tubular - Unit Austenitizing Furnace

Date: 12/9/2011
Pollutant: CO2
Monitor Span: 18.1

Run Number	Average Measured Percent	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Percent Moisture	Corrected Percent, Dry Basis	Corrected Percent, Wet Basis
1	10.68	0.30	-0.10	-2.21	10.50	10.60	0.55	10.68	18.40	10.80	8.80
2	10.07	-0.10	0.00	0.55	10.60	10.40	-1.10	10.68	18.60	10.20	8.30
3	10.52	0.00	-0.20	-1.10	10.40	10.40	0.00	10.68	19.40	10.80	8.70

Cgas = (Cavg - Co) * Cma / (Cm - Co)   Eq. 6C-1

where:
Cgas = Effluent gas concentration, dry basis, percent
Cavg = Average gas concentration indicated by gas analyzer, dry basis, percent
Co = Average of initial and final system calibration bias check responses for the zero gas, percent
Cm = Average of initial and final system calibration bias check responses for the upscale calibration gas, percent
Cma = Actual concentration of the upscale calibration gas, percent

Grace Consulting, Inc.

Sampling System Bias Check and Measured Value Correction

US Steel
Lorain Tubular - Unit Austenitizing Furnace

Date: 12/9/2011
Pollutant: O2
Monitor Span: 22.4

Run Number	Average Measured Percent	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Percent Moisture	Corrected Percent, Dry Basis	Corrected Percent, Wet Basis
1	1.63	0.00	0.00	0.00	11.00	10.70	-1.34	11.07	18.40	1.70	1.40
2	2.40	0.00	-0.10	-0.45	10.70	10.60	-0.45	11.07	18.60	2.50	2.00
3	1.42	-0.10	-0.10	0.00	10.60	10.60	0.00	11.07	19.40	1.60	1.30

Cgas = (Cavg - Co) * Cma / (Cm - Co)   Eq. 6C-1

where: Cgas = Effluent gas concentration, dry basis, percent
Cavg = Average gas concentration indicated by gas analyzer, dry basis, percent
Co = Average of initial and final system calibration bias check responses for the zero gas, percent
Cm = Average of initial and final system calibration bias check responses for the upscale calibration gas, percent
Cma = Actual concentration of the upscale calibration gas, percent

Grace Consulting, Inc.
Moisture Calculations (Runs 1 - 3)

Client: US Steel
Site: Lorain Tubular - Unit Austenitizing Furnace
Date: 12/09/11
Unit Number: Austenitizing Furnace

Run:	1	2	3
Total Impinger Content:	105.70	109.30	114.50
Volume Metered:	21.776	22.224	22.183
Meter Temperature:	39.00	40.00	41.00
Delta H:	1.60	1.60	1.60
Barometric Pressure:	29.51	29.51	29.51
Meter Correction Factor:	0.968	0.968	0.968
Volume Measured (DSCF):	22.08	22.49	22.40
Water Volume (SCF):	4.98	5.15	5.40
% Moisture in Flue Gas:	18.40	18.60	19.40

Grace Consulting, Inc.

Velocity Traverse Calculations and Results

Client: US Steel
Site: Lorain Tubular - Unit Austenitizing Furnace
Date: 12/09/11
Unit Number: Austenitizing Furnace

Run:		1	2	3
Start Time:		09:35	11:05	12:35
End Time:		09:41	11:10	12:42
Pitot Coefficient:		0.84	0.84	0.84
Barometric Pressure:	In. Hg.	29.51	29.51	29.51
Static Pressure:	In. H20	-0.04	-0.04	-0.04
Square Root of Delta-P:		0.217	0.221	0.218
Flue Temperature:	Deg. F.	1030.90	1086.00	1040.00
Percent CO2:	%	10.80	10.20	10.80
Percent O2:	%	1.70	2.50	1.60
Percent Moisture:	%	18.40	18.60	19.40
Area of Flue:	Sq. Ft.	12.57	12.57	12.57
Absolute Flue Pressure:	In. Hg.	29.51	29.51	29.51
Molecular Weight:	Lb/Lb Mole	27.63	27.55	27.50
Velocity of Flue Gas:	FPS	21.07	21.89	21.28
Volume of Flue Gas:	ACFM	15894	16507	16052
Volume of Flue Gas:	DSCFM	4528	4524	4489
Volume of Flue Gas:	KSCFM	5.55	5.56	5.57
Volume of Flue Gas:	KSCFH	332.95	333.44	334.20
Volume of Flue Gas:	SCFH	333000	333000	334000

Grace Consulting, Inc.

Sampling System Bias Check and Measured Value Correction

US Steel
Lorain Tubular - Unit Tempering Furnace

Date: 12/9/2011
Pollutant: NOx
Monitor Span: 100.4

Run Number	Average Measured Value	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Percent Moisture	Corrected Value, Dry Basis	Corrected Value, Wet Basis
1	24.49	0.40	2.60	2.19	47.00	48.50	1.49	48.32	5.50	24.00	22.70
2	24.20	2.60	2.10	-0.50	48.50	47.50	-1.00	48.32	5.80	23.10	21.80
3	24.65	2.10	3.00	0.90	47.50	48.70	1.20	48.32	5.90	23.40	22.00

Cgas = (Cavg - Co) * Cma / (Cm - Co) Eq. 6C-1

where: Cgas = Effluent gas concentration, dry basis, ppm
Cavg = Average gas concentration indicated by gas analyzer, dry basis, ppm
Co = Average of initial and final system calibration bias check responses for the zero gas, ppm
Cm = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm
Cma = Actual concentration of the upscale calibration gas, ppm

Grace Consulting, Inc.

Sampling System Bias Check and Measured Value Correction

US Steel
Lorain Tubular - Unit Tempering Furnace

Date: 12/9/2011
Pollutant: CO2
Monitor Span: 18.1

Run Number	Average Measured Percent	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Percent Moisture	Corrected Percent, Dry Basis	Corrected Percent, Wet Basis
1	8.36	0.00	0.20	1.10	10.40	10.90	2.76	10.68	5.50	8.40	7.90
2	8.19	0.20	0.10	-0.55	10.90	10.90	0.00	10.68	5.80	8.00	7.50
3	8.15	0.10	0.00	-0.55	10.90	10.90	0.00	10.68	5.90	8.00	7.50

$$C_{gas} = (C_{avg} - C_o) * C_{ma} / (C_m - C_o) \qquad \text{Eq. 6C-1}$$

where:
Cgas = Effluent gas concentration, dry basis, percent
Cavg = Average gas concentration indicated by gas analyzer, dry basis, percent
Co = Average of initial and final system calibration bias check responses for the zero gas, percent
Cm = Average of initial and final system calibration bias check responses for the upscale calibration gas, percent
Cma = Actual concentration of the upscale calibration gas, percent

Grace Consulting, Inc.

Sampling System Bias Check and Measured Value Correction

US Steel
Lorain Tubular - Unit Tempering Furnace

Date: 12/9/2011
Pollutant: O2
Monitor Span: 22.4

Run Number	Average Measured Percent	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Percent Moisture	Corrected Percent, Dry Basis	Corrected Percent, Wet Basis
1	6.70	0.04	0.10	0.27	10.78	10.80	0.09	11.07	5.50	6.80	6.40
2	7.09	0.10	0.10	0.00	10.80	10.90	0.45	11.07	5.80	7.20	6.80
3	7.25	0.10	0.10	0.00	10.90	10.90	0.00	11.07	5.90	7.30	6.90

Cgas = (Cavg - Co) * Cma / (Cm - Co) Eq. 6C-1

where:

Cgas = Effluent gas concentration, dry basis, percent
Cavg = Average gas concentration indicated by gas analyzer, dry basis, percent
Co = Average of initial and final system calibration bias check responses for the zero gas, percent
Cm = Average of initial and final system calibration bias check responses for the upscale calibration gas, percent
Cma = Actual concentration of the upscale calibration gas, percent

Grace Consulting, Inc.
Moisture Calculations (Runs 1 - 3)

Client: US Steel
Site: Lorain Tubular - Unit Tempering Furnace
Date: 12/09/11
Unit Number: Tempering Furnace

Run:	1	2	3
Total Impinger Content:	29.00	30.00	31.00
Volume Metered:	21.984	21.683	22.154
Meter Temperature:	48.00	52.00	54.00
Delta H:	1.793	1.793	1.793
Barometric Pressure:	29.51	29.51	29.51
Meter Correction Factor:	1.035	1.035	1.035
Volume Measured (DSCF):	23.42	22.92	23.33
Water Volume (SCF):	1.37	1.41	1.46
% Moisture in Flue Gas:	5.50	5.80	5.90

Grace Consulting, Inc.

Velocity Traverse Calculations and Results

Client: US Steel
Site: Lorain Tubular - Unit Tempering Furnace
Date: 12/09/11
Unit Number: Tempering Furnace

Run:		1	2	3
Start Time:		09:35	11:05	12:35
End Time:		09:42	11:12	12:42
Pitot Coefficient:		0.84	0.84	0.84
Barometric Pressure:	In. Hg.	29.51	29.51	29.51
Static Pressure:	In. H20	-0.04	-0.04	-0.04
Square Root of Delta-P:		0.128	0.164	0.148
Flue Temperature:	Deg. F.	635.40	561.00	564.00
Percent CO2:	%	8.40	8.00	8.00
Percent O2:	%	6.80	7.20	7.30
Percent Moisture:	%	5.50	5.80	5.90
Area of Flue:	Sq. Ft.	12.57	12.57	12.57
Absolute Flue Pressure:	In. Hg.	29.51	29.51	29.51
Molecular Weight:	Lb/Lb Mole	28.98	28.90	28.89
Velocity of Flue Gas:	FPS	10.40	12.89	11.65
Volume of Flue Gas:	ACFM	7847	9720	8785
Volume of Flue Gas:	DSCFM	3523	4668	4202
Volume of Flue Gas:	KSCFM	3.73	4.96	4.47
Volume of Flue Gas:	KSCFH	223.71	297.30	267.94
Volume of Flue Gas:	SCFH	224000	297000	268000

Test Methods used at US Steel, Lorain Tubular – Austenitizing Furnace

Method 1, 2 and 4

GCI performed 3 Method 2 test runs to determine the KSCFH of flue gas exiting the stack. A 12 point traverse was tested for each Method 2 test run. One moisture test was performed for each run of Method 2 testing.

Method 3A

CO_2 and O_2 concentrations were determined with 3 Method 3A test runs. The sampling was performed at 3-points. GCI used a monitor range of 0-18.1% for CO_2 and a monitor range of 0-22.4% for the O_2.

Method 7E

NO_x emissions were determined with 3 Method 7E test runs. The sampling was performed at 3-points. GCI used a monitor span of 100.4 ppm for NO_x.

Test Methods used at US Steel, Lorain Tubular –Tempering Furnace

Method 1, 2 and 4

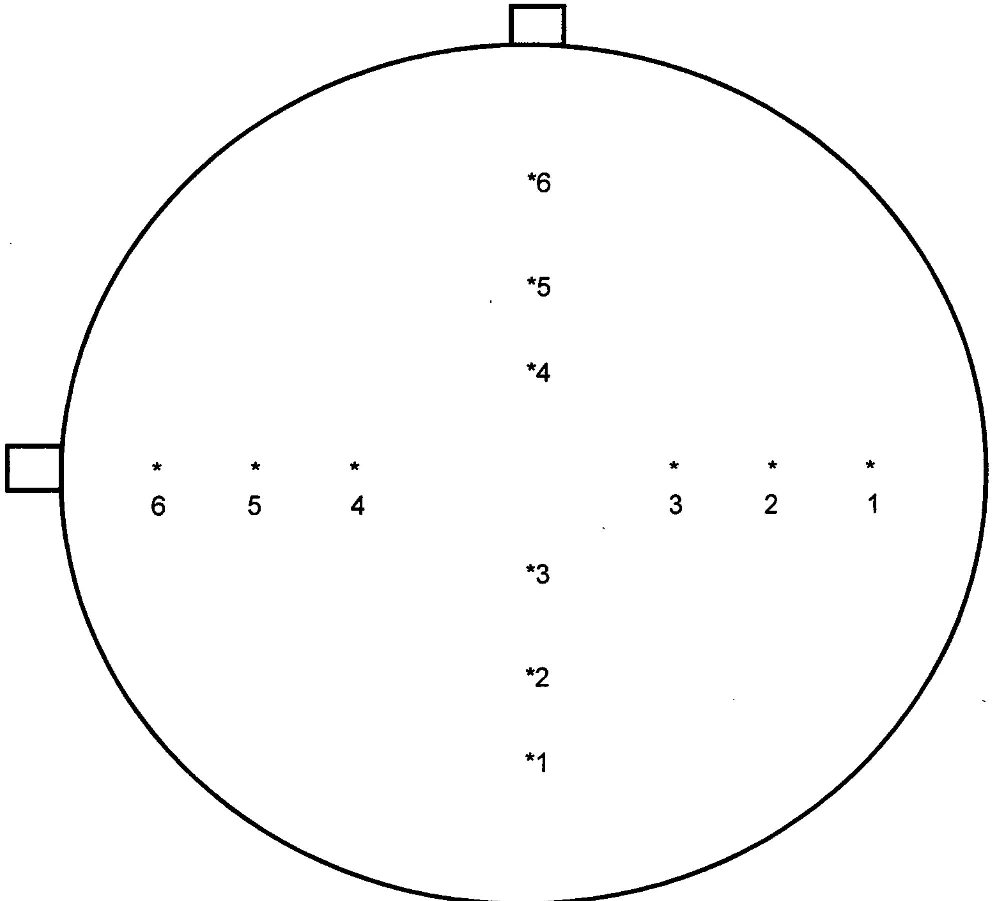
GCI performed 3 Method 3 test runs to determine the KSCFH of flue gas exiting the stack. A 12 point traverse was tested for each Method 2 test run. One moisture test was performed for each run of Method 2 testing.

Method 3A

CO_2 and O_2 concentrations were determined with 3 Method 3A test runs on the Normal load. The sampling was performed at 3-points. GCI used a monitor range of 0-18.1% for CO_2 and a monitor range of 0-22.4% for the O_2.

Method 7E

NO_x emissions were determined with 3 Method 7E test runs. The sampling was performed at 3-points. GCI used a monitor span of 100.4 ppm for NO_x.



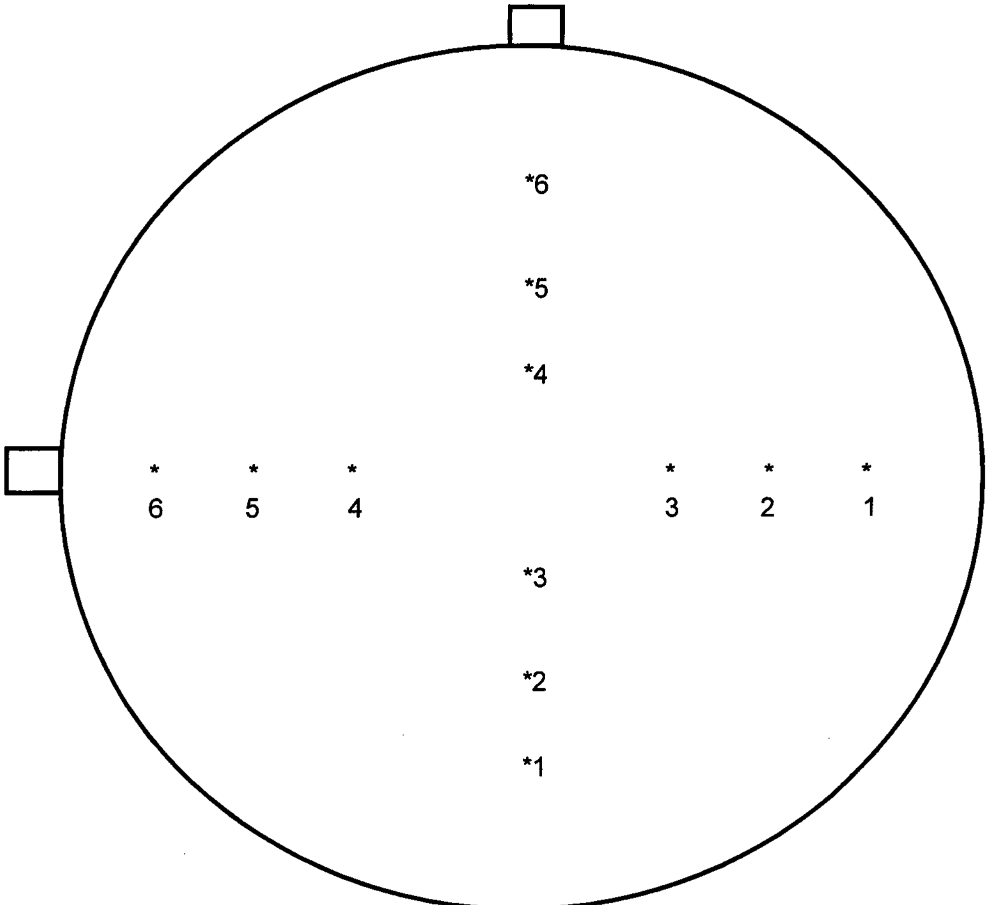
DRAWING NOT TO SCALE

POINTS	DISTANCE FROM INSIDE WALL
1)	45.895 "
2)	40.998 "
3)	33.797 "
4)	14.210 "
5)	7.009 "
6)	2.112 "

STACK AREA = 12.57 sq ft
STACK DIAMETER = 48.0 "

Grace Consulting, Inc.
Emissions Testing Services

Lorain Tubular
Austenitizing Furnace



DRAWING NOT TO SCALE

POINTS	DISTANCE FROM INSIDE WALL
1)	45.895 "
2)	40.998 "
3)	33.797 "
4)	14.210 "
5)	7.009 "
6)	2.112 "

STACK AREA = 12.57 sq ft
STACK DIAMETER = 48.0 "

Grace Consulting, Inc.
Emissions Testing Services

Lorain Tubular
Tempering Furnace

NO_x CALCULATION
(O_2 Based)

lb/dscf = $1.194 \times 10^{-7} \times$ PPM

lb/mmBtu = lb/dscf x f-factor x $\frac{20.9}{20.9 - \%O_2}$

lb/hour = lb/dscf x dscfm x 60 min./hr

SAMPLING SYSTEM BIAS CORRECTION

EMISSION CALCULATION
(CFR 40, Part 60, Appendix A)

Eq. 6C-1

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

Where:

- C_{gas} = Effluent gas concentration, dry basis, ppm.
- $\bar{C}$ = Average gas concentration indicated by gas analyzer, dry basis, ppm.
- C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm.
- C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm.
- C_{ma} = Actual concentration of the upscale calibration gas, ppm.

VELOCITY NOMENCLATURE

A	=	cross-sectional area of stack, (ft^2)
acf	=	actual cubic feet
acfm	=	actual cubic feet per minute
B_{ws}	=	water vapor in the gas stream, proportion by volume
C_p	=	pitot tube coefficient, dimensionless
dscf	=	dry standard cubic feet
dscm	=	dry standard cubic meters
fps	=	feet per second
gm-mole	=	gram-mole
ΔH	=	orifice pressure drop in inches water, average
hr	=	hour
I	=	percent of isokinetic sampling
In. Hg	=	inches mercury
lbs	=	pounds
lb-mole	=	pound-mole
%M	=	percent moisture by volume
mmBtu	=	million Btu
M_s	=	molecular weight of stack gas, wet basis, (lb/lb-mole)
n	=	total number of traverse points
P_b	=	barometric pressure at the sampling site, (in Hg)
P_f	=	static pressure in flue in inches water, average
P_s	=	absolute stack gas pressure, (in. Hg)
P_{std}	=	standard absolute pressure, (29.92 in. Hg) (14.7 psia)
P_t	=	total pressure in inches of water
P_v	=	average velocity pressure in inches of water
Q_{sd}	=	dry volumetric stack gas flow rate corrected to standard conditions, (dscf/hr)
R	=	universal gas constant, (1545 ft lb/mole, °R)
$\sqrt{\Delta P}$	=	square root of velocity head in inches water, average
scf	=	standard cubic feet
scm	=	standard cubic meters
T_m	=	absolute average DGM temperature, (°R)
T_s	=	absolute average stack gas temperature, (°R)
T_{std}	=	standard absolute temperature, (528 °R)
V_I	=	volume of condensate through the impingers, ml
V_{lc}	=	total volume of liquid collected in impingers and silica gel, ml
V_m	=	volume of gas sample as measured by dry gas meter, (dcf)
$V_{m(std)}$	=	volume of gas sample measured by the dry gas meter, corrected to standard conditions, (dscf)
V_o	=	volume of flue gas at actual conditions in cubic feet per minute
$V_{w(std)}$	=	volume of water vapor in the gas sample, corrected to standard conditions, (scf)
V_{wc}	=	volume of water condensed in impingers corrected to standard conditions
V_{wsg}	=	volume of water collected in silica gel corrected to standard conditions
V_s	=	average stack gas velocity, (ft/sec)
W_{sg}	=	weight gain of impinger silica gel in grams
Y	=	dry gas meter calibration factor
*	=	total sampling time, min
V_p	=	mass of flue gas (lb/hr)

Moisture Field Data Sheet

[redacted]ent: [redacted] Loraine Tubul	Date: 12-9-11
Project No: 11-412	Operator: D Mccoy
Sampling Location: AF	Run No: 1-3
Barometric Pressure: 29.51	Probe Number:

Initial Impinger Weight:	Run 1	Run 2	Run 3	Final Impinger Weight:	Run 1	Run 2	Run 3
	BACK				105.7	109.3	114.5

Leak Test @[mm HG]	After @[mmHG]	Meter-Orifice	Meter #	Meter Corr:
Run 1 .004 @ 20	.000 @ 7	2.67332	12A	.968

Leak Test @[mm HG]	After @[HG]	Leak Test @[mm HG]	After @[mm HG]
Run 2 .002 @ 17	.000 @ 10	Run 3	

Sample Point		ΔH	Temperature F Probe	Imp. Out	Meter In	Meter Out	Vac Pr (in. HG)	Dry Gas Meter Reading in Cu. Ft.
0	**Start Run #1**							693.225
5	9:35	1.6		33		38	5	696.94
10				34		38		700.64
15	Run 1			37		39		704.33
20				38		40		708.05
25				39		40		711.74
30	10:05	1.6		40		41	5	715.001
	Avg.					~~39.333~~ 39		21.776
0	**Start Run #2**							715,100
5	11:05	1.6		33		39	5	718.80
10				35		40		722.50
15	Run 2			39		40		726.24
20				41		40		729.90
25				43		41		733.60
30	11:35	1.6		43		40	5	737.324
	Avg.					Ave 40		22.224
0	**Start Run #3**							737.550
5	12:35	1.6		37		40	5	741.24
10				38		41		744.94
15	Run 3			39		41		748.64
20				40		41		752.34
25				41		42		756.02
30	13:05	1.6		42		42	5	759.733
	Avg.					41		22.183

Flow Data Sheet w/ SQ of Delta P

Client:	Lorain Tubular	Date	12-9-11
Project No.	11-412	Operator	D Moody
Sampling Location	AF Austenitizing Furnace	Load	
Barometric Pressure	29.51	Probe Number	Pitot#

St. Pres	-.04				-.04			-0.04	
Start	9:35	9:41	1	11:05	11:10	2	12:35	12:42	3
Sample Point	Delta P	√ΔP	Stack Temp	Delta P	√ΔP	Stack Temp	Delta P	√ΔP	Stack Temp
A-1	.06	.245	1100	.06	.245	1094	.05	.224	1002
A-2	.07	.265	1106	.06	.245	1098	.04	.200	1017
A-3	.07	.265	1060	.07	.265	1098	.06	.245	1032
A-4	.05	.224	1056	.03	.173	1084	.04	.200	1049
A5 ~~B-1~~	.03	.173	980	.05	.224	1035	.06	.245	1029
A6 ~~B-2~~	.02	.141	976	.04	.200	1047	.02	.141	1030
B1 ~~B-3~~	.05	.224	960	.06	.245	1082	.07	.265	1065
B2 ~~B-4~~	.05	.224	991	.05	.224	1082	.07	.265	1070
B3 ~~C-1~~	.06	.245	1001	.07	.265	1106	.07	.265	1047
B4 ~~C-2~~	.05	.224	1043	.05	.224	1110	.05	.224	1039
B5 ~~C-3~~	.04	.200	1051	.03	.173	1117	.02	.141	1053
B6 ~~C-4~~	.03	.173	1047	.03	.173	1077	.04	.200	1045
~~D-1~~									
~~D-2~~									
~~D-3~~									
~~D-4~~		.217	1030.9		.221	1086		.218	~~1034.83~~ 1040

Pitot Leak Check After: ✓	Pitot Leak Check After: ✓	Pitot Leak Check After: ✓

Client	US Steel		Project #	11-412		Date	12/9/2011
Unit	Austentizing Furnace		Load	High		Operator	Stiles
Plant	Lorain Tubular			*Run 1*			

		Time	O2 %	Dev	CO2 %	% Dev	NOx PPM	% Dev
	1	9:36	1.9		10.8		52.1	
	2	9:37	1.8		10.7		52.6	
	3	9:38	1.9		10.4		52.1	
	4	9:39	2.0		10.3		51.8	
	5	9:40	1.9		10.3		52.4	
	6	9:41	1.9		10.4		52.5	
	7	9:42	1.9		10.7		52.5	
	8	9:43	1.8		10.8		52.9	
	9	9:44	1.8		10.8		52.6	
	10	9:45	1.8		10.8		52.4	
	11	9:46	1.7		10.6		52.9	
	12	9:47	1.8		10.4		52.8	
	13	9:48	2.0		10.3		52.4	
	14	9:49	2.0		10.3		52.3	
	15	9:50	1.9		10.4		52.4	
	16	9:51	1.8		10.8		52.5	
	17	9:52	1.8		10.8		52.2	
	18	9:53	1.8		10.8		52.1	
	19	9:54	1.8		10.8		52.3	
	20	9:55	1.7		10.6		52.4	
Average			**1.9**	**0.22**	**10.6**	**-0.80%**	**52.4**	**1.43%**
	21	9:56	1.7		10.5		52.1	
	22	9:57	1.8		10.4		52.1	
	23	9:58	1.9		10.4		52.2	
	24	9:59	1.8		10.5		52.1	
	25	10:00	1.7		10.8		51.9	
	26	10:01	1.7		10.9		51.7	
	27	10:02	1.8		10.8		51.8	
	28	10:03	1.7		10.9		51.9	
	29	10:04	1.6		10.6		52.1	
	30	10:05	1.5		10.5		52.2	
	31	10:06	1.5		10.6		51.8	
	32	10:07	1.4		10.6		51.5	
	33	10:08	1.4		10.7		51.5	
	34	10:09	1.5		11.0		51.3	
	35	10:10	1.7		10.9		51.3	
	36	10:11	1.8		10.8		51.5	
	37	10:12	1.7		10.9		51.7	
	38	10:13	1.6		10.6		51.7	
	39	10:14	1.6		10.5		51.7	
	40	10:15	1.5		10.5		51.5	
Average			**1.7**	**0.02**	**10.7**	**0.03%**	**51.8**	**0.24%**
	41	10:16	1.4		10.6		51.5	
	42	10:17	1.3		10.8		51.3	
	43	10:18	1.3		11.1		51.1	

	44	10:19	1.5		11.0		51.0	
	45	10:20	1.5		10.9		50.8	
	46	10:21	1.5		10.9		50.5	
	47	10:22	1.5		10.6		50.5	
	48	10:23	1.5		10.5		50.7	
	49	10:24	1.4		10.6		50.6	
	50	10:25	1.4		10.5		50.6	
	51	10:26	1.4		10.7		50.8	
	52	10:27	1.4		11.0		51.0	
	53	10:28	1.5		11.0		50.8	
	54	10:29	1.5		11.0		50.5	
	55	10:30	1.4		11.0		50.6	
	56	10:31	1.4		10.6		50.6	
	57	10:32	1.3		10.6		50.6	
	58	10:33	1.3		10.6		50.6	
	59	10:34	1.3		10.6		50.7	
	60	10:35	1.3		10.8		50.7	
Average			**1.4**	**-0.22**	**10.8**	**0.86%**	**50.8**	**-1.70%**
		Average	1.63		10.68		51.66	

Client	US Steel	Project #	11-412	Date	12/9/2011
Unit	Austentizing Furnace	Load	High	Operator	Stiles
Plant	Lorain Tubular				

Run 2

	Time	O2 %	CO2 %	NOx PPM
1	11:06	1.4	10.9	50.6
2	11:07	1.4	10.6	50.6
3	11:08	1.4	10.5	50.7
4	11:09	1.3	10.6	50.7
5	11:10	1.2	10.6	50.5
6	11:11	1.4	10.9	50.3
7	11:12	1.4	10.9	50.1
8	11:13	1.4	10.9	50.2
9	11:14	1.4	10.9	50.3
10	11:15	1.4	10.8	50.2
11	11:16	1.4	10.5	50.2
12	11:17	1.4	10.5	50.3
13	11:18	1.4	10.5	50.3
14	11:19	1.5	10.5	50.3
15	11:20	1.5	10.8	50.8
16	11:21	1.5	10.9	51.1
17	11:22	1.4	10.9	51.4
18	11:23	1.4	10.9	51.6
19	11:24	1.4	10.7	51.9
20	11:25	1.6	10.4	51.9
21	11:26	1.6	10.4	52.3
22	11:27	1.5	10.4	52.7
23	11:28	1.6	10.4	52.5
24	11:29	1.8	10.6	52.1
25	11:30	1.9	10.6	52.1
26	11:31	2.3	10.4	52.1
27	11:32	2.7	10.1	52.4
28	11:33	3.1	9.7	52.9
29	11:34	3.5	9.2	53
30	11:35	4.3	8.8	52.8
31	11:36	4.9	8.3	51.8
32	11:37	4.3	8.8	53.4
33	11:38	3.9	9.3	54.2
34	11:39	3.8	9.5	54.2
35	11:40	3.6	9.7	54.2
36	11:41	3.3	9.8	54.3
37	11:42	3.1	9.7	53.7
38	11:43	3.1	9.5	53.1
39	11:44	2.9	9.5	53
40	11:45	2.6	9.6	53.1
41	11:46	2.5	9.7	53.2
42	11:47	2.7	10	52.7
43	11:48	2.8	9.9	53
44	11:49	3.2	9.7	53.4
45	11:50	4.1	9.2	52.5
46	11:51	4.7	8.5	51.7

47	11:52	4.6	8.5	52.9
48	11:53	4	8.8	54.3
49	11:54	3.4	9.2	55.2
50	11:55	3.1	9.4	54.9
51	11:56	2.9	9.9	54.8
52	11:57	2.6	10.1	54.3
53	11:58	2.4	10.3	53.9
54	11:59	2.2	10.4	53.2
55	12:00	2	10.2	52.2
56	12:01	2	10.1	51.5
57	12:02	1.8	10.2	51.3
58	12:03	1.7	10.2	51.4
59	12:04	1.6	10.4	51.2
60	12:05	1.5	10.7	51.1
	Average	2.40	10.07	52.21

Client	US Steel	Project #	11-412	Date	12/9/2011
Unit	Austentizing Furnace	Load	High	Operator	Stiles
Plant	Lorain Tubular				

Run 3

	Time	O2 %	CO2 %	NOx PPM
1	12:36	1.7	10.3	51.6
2	12:37	1.5	10.3	51.3
3	12:38	1.4	10.4	51.3
4	12:39	1.6	10.3	50.9
5	12:40	1.5	10.5	50.9
6	12:41	1.4	10.8	51
7	12:42	1.4	10.8	51
8	12:43	1.4	10.8	51
9	12:44	1.3	10.8	51.4
10	12:45	1.4	10.5	51.4
11	12:46	1.4	10.4	51.3
12	12:47	1.4	10.4	51.4
13	12:48	1.4	10.4	51.5
14	12:49	1.4	10.5	51.3
15	12:50	1.3	10.8	51.3
16	12:51	1.4	10.8	51.1
17	12:52	1.4	10.8	51.3
18	12:53	1.4	10.8	51.2
19	12:54	1.4	10.4	51.2
20	12:55	1.6	10.2	51
21	12:56	1.6	10.2	50.9
22	12:57	1.6	10.2	51
23	12:58	1.6	10.4	50.7
24	12:59	1.6	10.6	50.6
25	13:00	1.6	10.7	50.7
26	13:01	1.6	10.6	50.5
27	13:02	1.5	10.6	50.7
28	13:03	1.5	10.3	51
29	13:04	1.5	10.3	50.9
30	13:05	1.6	10.2	50.6
31	13:06	1.5	10.2	50.6
32	13:07	1.5	10.4	50.6
33	13:08	1.4	10.7	50.8
34	13:09	1.4	10.7	50.8
35	13:10	1.4	10.7	50.9
36	13:11	1.4	10.7	50.6
37	13:12	1.4	10.4	50.8
38	13:13	1.3	10.4	50.9
39	13:14	1.3	10.4	50.7
40	13:15	1.3	10.4	50.8
41	13:16	1.3	10.5	50.5
42	13:17	1.3	10.7	50.3
43	13:18	1.4	10.7	50
44	13:19	1.4	10.7	50.2
45	13:20	1.4	10.6	50.6

46	13:21	1.3	10.3	50.7
47	13:22	1.2	10.4	50.7
48	13:23	1.3	10.3	50.3
49	13:24	1.3	10.3	50.4
50	13:25	1.4	10.5	50.4
51	13:26	1.4	10.7	50.5
52	13:27	1.5	10.7	50.6
53	13:28	1.5	10.7	50.6
54	13:29	1.4	10.7	50.7
55	13:30	1.3	10.4	50.7
56	13:31	1.3	10.4	50.4
57	13:32	1.2	10.4	50.6
58	13:33	1.3	10.4	50.5
59	13:34	1.2	10.7	50.5
60	13:35	1.2	10.9	50.4
	Average	1.42	10.52	50.82

Moisture Field Data Sheet

Client: ~~First Energy~~ Lorain tublar				Date: 12-9-11				
Project No: 11-412				Operator: R. Prosser				
Sampling Location: TF				Run No: 1+2+3				
Barometric Pressure: 29.51				Probe Number:				
Initial Impinger Weight:	Run 1 3359	Run 2 3384	Run 3	Final Impinger Weight:	Run 1 3388 (29)	Run 2 3414 (30)	Run 3 31 mL	
Leak Test @[mm HG] Run 1 .000@20	After @[mmHG] .000@10			Meter-Orifice 3.333483	Meter # 20A	Meter Corr: 1.035		
Leak Test @[mm HG] Run 2 .000@20	After @[HG] .000@10			Leak Test @[mm HG] Run 3 .000@19	After @[mm HG] .000@8			

Sample Point		ΔH	Temperature F Probe	Imp. Out	Meter In	Meter Out	Vac Pr (in. HG)	Dry Gas Meter Reading in Cu. Ft.
0	Start Run #1	1.793		~~50~~				585.200
5	9:35			50	48		3	588.897
10				50	48		3	592.658
15				51	48		3	596.412
20				51	48		3	600.109
25				51	48		3	603.805
30	10:05			51	49		3	607.184
	Avg.				48			21.984
0	Start Run #2	1.793		49	52		3	608.010
5	11:05			49	52		3	611.759
10				50	52		3	615.455
15				51	52		3	619.205
20				51	53		3	622.904
25				51	53		3	626.664
30	11:35			51	53		3	628.693
	Avg.				52			21.683
0	Start Run #3	1.793		51	54		3	630.123
5	12:35			51	54		3	633.872
10				52	54		3	637.571
15				53	54		3	641.321
20				53	54		3	645.081
25				53	55		3	648.778
30	13:05			53	55		3	652.277
	Avg.				54			22.154

R1

Flow Data Sheet w/ SQ of Delta P

Client: Lorain tublar		Date 12-9-11	
Project No. 11-412		Operator R. Prosser	
Sampling Location TF Tempering Furnace		Load	
Barometric Pressure 29.51		Probe Number	Pitot#

St. Pres	-.04								
Start	9:35								

Sample Point	Delta P	√ΔP	Stack Temp	Delta P	√ΔP	Stack Temp	Delta P	√ΔP	Stack Temp
A-1	.03	.133	560						
A-2	.026	.161	609						
A-3	.019	.138	611						
A-4	.013	.114	690						
A-5 ~~B-1~~	.010	.100	677						
A-6 ~~B-2~~	.010	.100	668						
B-1 ~~B-3~~	.028	.167	622						
B-2 ~~B-4~~	.024	.155	617						
B-3 ~~C-1~~	.018	.134	635						
B-4 ~~C-2~~	.014	.118	647						
B-5 ~~C-3~~	.011	.105	648						
B-6 ~~C-4~~	.012	.110	641						
D-1									
D-2									
D-3									
D-4		.128	635.4						

Before ✓ Pitot Leak Check After: ✓	Pitot Leak Check After:	Pitot Leak Check After:

9:42

R2

Flow Data Sheet w/ SQ of Delta P

Client: Lorain tubular		Date 12-9-11	
Project No. 11-412		Operator R. Prosser	
Sampling Location TF		Load	
Barometric Pressure 29.51		Probe Number	Pitot#
St. Pres -.04			
Start 11:05			

Sample Point	Delta P	√ΔP	Stack Temp	Delta P	√ΔP	Stack Temp	Delta P	√ΔP	Stack Temp
A-1	.04	.200	560						
A-2	.041	.202	547						
A-3	.036	.190	555						
A-4	.03	.173	560						
A-5 ~~B-1~~	.024	.155	554						
A-6 ~~B-2~~	.02	.141	550						
B-1 ~~B-3~~	.036	.190	580						
B-2 ~~B-4~~	.03	.173	586						
B-3 ~~C-1~~	.025	.158	547						
B-4 ~~C-2~~	.02	.141	585						
B-5 ~~C-3~~	.018	.134	558						
B-6 ~~C-4~~	.013	.114	549						
D-1									
D-2									
D-3									
D-4		.164	$\overline{561}$						

Before Pitot Leak ✓ Check After: ✓	Pitot Leak Check After:	Pitot Leak Check After:

11:12

3

Flow Data Sheet w/ SQ of Delta P

Client: Lorain Tubular					Date 12-9-11				
Project No. 11-412					Operator R. Prosser				
Sampling Location TF					Load				
Barometric Pressure 29.51					Probe Number			Pitot#	
St. Pres	-.04								
Start	12:35								
Sample Point	Delta P	√ΔP	Stack Temp	Delta P	√ΔP	Stack Temp	Delta P	√ΔP	Stack Temp
A-1	.04	.200	589						
A-2	.034	.184	560						
A-3	.023	.152	543						
A-4	.02	.141	541						
A-5 ~~B-1~~	.016	.126	527						
A-6 ~~B-2~~	.011	.105	540						
B-1 ~~B-3~~	.03	.173	558						
B-2 ~~B-4~~	.028	.167	567						
B-3 ~~C-1~~	.024	.155	579						
B-4 ~~C-2~~	.02	.141	590						
B-5 ~~C-3~~	.016	.126	606						
B-6 ~~C-4~~	.012	.110	569						
D-1									
D-2									
D-3		.148	564						
D-4									

Before Pitot Leak ✓
Check After: ✓

Pitot Leak
Check After:

Pitot Leak
Check After:

12:42

Client	US Steel			Project #	11-412		Date	12/9/2011
Unit	Tempering Furnace			Load	High		Operator	Stiles
Plant	Lorain Tubulai				***Run 1***			

	Time	O2 %	% Dev	CO2 %	% Dev	Nox	% Dev
1	9:36	6.8		8.2		24.3	
2	9:37	6.6		8.3		24.5	
3	9:38	6.7		8.3		24.7	
4	9:39	6.7		8.2		24.6	
5	9:40	6.8		8.3		24.4	
6	9:41	6.7		8.3		24.3	
7	9:42	6.6		8.4		23.2	
8	9:43	6.5		8.4		23.2	
9	9:44	6.6		8.4		23.4	
10	9:45	6.5		8.4		23.8	
11	9:46	6.7		8.4		24.2	
12	9:47	6.7		8.4		24.4	
13	9:48	6.7		8.3		24.6	
14	9:49	6.8		8.4		24.8	
15	9:50	6.7		8.3		25.2	
16	9:51	6.8		8.3		25.3	
17	9:52	6.8		8.3		25.4	
18	9:53	6.8		8.3		25.5	
19	9:54	6.7		8.4		25.4	
20	9:55	6.7		8.4		25.4	
Average		**6.70**	**-0.12%**	**8.34**	**-0.34%**	**24.53**	**0.16%**
21	9:56	6.7		8.4		25.4	
22	9:57	6.7		8.3		25.3	
23	9:58	6.8		8.3		25.2	
24	9:59	6.9		8.3		25.2	
25	10:00	6.8		8.3		25.1	
26	10:01	6.9		8.2		25.1	
27	10:02	7		8.2		24.9	
28	10:03	6.9		8.3		24.7	
29	10:04	6.9		8.3		24.7	
30	10:05	6.9		8.3		24.6	
31	10:06	6.8		8.3		24.5	
32	10:07	6.8		8.4		24.6	
33	10:08	6.7		8.4		24.6	
34	10:09	6.6		8.4		24.6	
35	10:10	6.6		8.4		24.4	
36	10:11	6.7		8.4		24.3	
37	10:12	6.6		8.4		24.1	
38	10:13	6.7		8.4		24	
39	10:14	6.7		8.4		23.8	
40	10:15	6.6		8.5		23.7	
Average		**6.77**	**0.92%**	**8.35**	**-0.22%**	**24.64**	**0.61%**
41	10:16	6.6		8.4		23.8	
42	10:17	6.7		8.4		23.9	
43	10:18	6.7		8.4		24.1	

	44	10:19	6.7		8.4		24.3	
	45	10:20	6.7		8.4		24.4	
	46	10:21	6.7		8.4		24.4	
	47	10:22	6.6		8.4		24.5	
	48	10:23	6.7		8.4		24.5	
	49	10:24	6.6		8.4		24.4	
	50	10:25	6.6		8.5		24.3	
	51	10:26	6.5		8.4		24.3	
	52	10:27	6.6		8.4		24.3	
	53	10:28	6.6		8.5		24.4	
	54	10:29	6.6		8.4		24.4	
	55	10:30	6.7		8.4		24.4	
	56	10:31	6.6		8.4		24.4	
	57	10:32	6.7		8.4		24.4	
	58	10:33	6.7		8.4		24.3	
	59	10:34	6.7		8.4		24.3	
	60	10:35	6.7		8.4		24.3	
Average			**6.65**	**-0.80%**	**8.41**	**0.56%**	**24.31**	**-0.76%**
		Average	**6.70**		**8.36**		**24.49**	

Client	US Steel	Project #	11-412	Date	12/9/2011
Unit	Tempering Furnace	Load	High	Operator	Stiles
Plant	Lorain Tubulai				

Run 2

Time	O2 %	CO2 %	NOx PPM
11:06	6.5	8.3	24.0
11:07	6.7	8.4	24.2
11:08	6.6	8.4	24.1
11:09	6.6	8.5	23.7
11:10	6.5	8.4	23.7
11:11	6.6	8.4	23.8
11:12	6.6	8.5	23.8
11:13	6.6	8.5	23.9
11:14	6.6	8.4	24.0
11:15	6.6	8.5	23.9
11:16	6.6	8.5	23.9
11:17	6.5	8.5	23.9
11:18	6.5	8.5	23.9
11:19	6.6	8.4	24.0
11:20	6.7	8.4	24.0
11:21	6.7	8.4	24.0
11:22	6.7	8.4	24.0
11:23	6.7	8.4	24.0
11:24	6.7	8.4	24.0
11:25	6.7	8.4	24.1
11:26	6.7	8.4	24.1
11:27	6.6	8.5	24.1
11:28	6.6	8.4	24.1
11:29	6.6	8.4	24.0
11:30	6.6	8.4	24.0
11:31	6.6	8.5	24.0
11:32	6.6	8.5	24.0
11:33	6.6	8.4	24.0
11:34	6.7	8.4	24.1
11:35	6.7	8.3	24.3
11:36	6.8	8.4	24.3
11:37	6.7	8.3	24.4
11:38	6.9	8.3	24.4
11:39	6.9	8.3	24.5
11:40	6.9	8.2	24.7
11:41	7.1	8.2	24.8
11:42	7.2	8.1	24.8
11:43	7.3	8.1	24.9
11:44	7.5	8.0	25.1
11:45	7.8	7.8	25.2
11:46	8.0	7.8	25.0
11:47	7.9	7.8	25.0
11:48	8.1	7.7	25.0
11:49	8.1	7.8	24.9
11:50	7.9	7.7	24.8
11:51	8.1	7.7	24.7
11:52	8.0	7.8	24.5
11:53	7.8	7.8	24.4

11:54	7.8	7.9	24.5
11:55	7.6	7.9	24.4
11:56	7.7	7.9	24.3
11:57	7.6	8.0	24.0
11:58	7.5	7.9	23.8
11:59	7.6	7.9	23.8
12:00	7.6	7.9	23.7
12:01	7.5	7.9	23.8
12:02	7.5	7.9	23.8
12:03	7.7	7.7	23.8
12:04	8.0	7.8	23.6
12:05	7.5	8.2	23.7
Average	**7.09**	**8.19**	**24.20**

Client	US Steel	Project #	11-412	Date	12/9/2011
Unit	Tempering Furnace	Load	High	Operator	Stiles
Plant	Lorain Tubular				

Run 3

	Time	O2 %	CO2 %	NOx PPM
1	12:36	7.6	7.9	24.2
2	12:37	7.5	8	24.1
3	12:38	7.4	8	24.1
4	12:39	7.4	8	24.2
5	12:40	7.5	7.9	24.3
6	12:41	7.7	7.9	24.2
7	12:42	7.7	7.9	24.2
8	12:43	7.6	8	24.4
9	12:44	7.5	8	24.5
10	12:45	7.5	8.1	24.6
11	12:46	7.4	8.1	24.6
12	12:47	7.3	8.1	24.6
13	12:48	7.2	8.2	24.5
14	12:49	7.1	8.2	24.5
15	12:50	7	8.3	24.4
16	12:51	7	8.2	24.4
17	12:52	7	8.2	24.3
18	12:53	7.1	8.2	24.2
19	12:54	7	8.3	24.1
20	12:55	6.8	8.3	24.1
21	12:56	6.9	8.3	24
22	12:57	6.9	8.3	24
23	12:58	7	8.3	24
24	12:59	6.9	8.3	24.1
25	13:00	7.1	8.2	24.2
26	13:01	7.1	8.2	24.5
27	13:02	7.2	8.1	24.9
28	13:03	7.3	8.2	25.2
29	13:04	7.3	8	25.4
30	13:05	7.6	8	25.5
31	13:06	7.4	8.1	25.5
32	13:07	7.4	8	25.6
33	13:08	7.5	8	25.6
34	13:09	7.5	8	25.5
35	13:10	7.5	8.1	25.3
36	13:11	7.4	8.1	25.3
37	13:12	7.4	8	25.3
38	13:13	7.5	8.1	25.2
39	13:14	7.3	8.1	25.2
40	13:15	7.4	8.1	25.1
41	13:16	7.5	8	25
42	13:17	7.5	8.1	24.9
43	13:18	7.5	8.1	24.8
44	13:19	7.4	8.1	24.8

45	13:20	7.3	8.1	24.8
46	13:21	7.3	8.2	24.9
47	13:22	7.2	8.2	24.8
48	13:23	7.2	8.2	24.7
49	13:24	7.2	8.2	24.6
50	13:25	7.1	8.3	24.5
51	13:26	7	8.3	24.5
52	13:27	7	8.3	24.5
53	13:28	7	8.3	24.6
54	13:29	7	8.3	24.7
55	13:30	6.9	8.3	24.6
56	13:31	6.9	8.3	24.5
57	13:32	6.9	8.4	24.4
58	13:33	6.8	8.3	24.4
59	13:34	6.9	8.3	24.4
60	13:35	6.8	8.3	24.4
	Average	**7.25**	**8.15**	**24.65**

Nox Cal Sheet 1

Client	US Steel		Test Date	12/9/2011
	Lorain Tubular		Project #	11-412
Source Identification	Austentizing Furnace		Operator	stiles

Calibration Data For Sampling Runs: 1- Gas Type: NOx Span: 100.4	Cylinder Number	Cylinder Value % or PPM	Analyzer Response	Absolute Difference % or PPM	Difference % of Span	
Zero Gas		**0.00**	0.30	0.30	0.299	
No2 to No Converter Check		**43.92**	40.12	3.80	91.35%	**PASS**
Mid-Range Gas		**48.32**	49.30	0.98	0.976	
High-Range Gas		**100.40**	101.10	0.70	0.697	

Run #: 1 Gas Type: NOx Span: 100.4	Analyzer Response	Initial Values		Final Values		Drift % of Span
		System Response	System Cal. Bias % of Span	System Response	System Cal. Bias % of Span	
Zero Gas	0.30	0.70	0.40	0.80	0.50	0.10
Upscale Gas	49.30	48.90	-0.40	47.60	-1.69	-1.29

Run #: 2 Gas Type: NOx Span: 100.4	Analyzer Response	Initial Values		Final Values		Drift % of Span
		System Response	System Cal. Bias % of Span	System Response	System Cal. Bias % of Span	
Zero Gas	0.30	0.80	0.50	0.50	0.20	-0.30
Upscale Gas	49.30	47.60	-1.69	46.90	-2.39	-0.70

Run #: 3 Gas Type: NOx Span: 100.4	Analyzer Response	Initial Values		Final Values		Drift % of Span
		System Response	System Cal. Bias % of Span	System Response	System Cal. Bias % of Span	
Zero Gas	0.30	0.50	0.20	0.60	0.30	0.10
Upscale Gas	49.30	46.90	-2.39	47.30	-1.99	0.40

Client	US Steel		Test Date	12/9/2011
	Lorain Tubular		Project #	11-412
Source Identification	Austentizing Furnace		Operator	stiles

Calibration Data For Sampling Runs: 1- Gas Type: CO2 Span: 18.1	Cylinder Number	Cylinder Value % or PPM	Analyzer Response	Absolute Difference % or PPM	Difference % of Span	
Zero Gas		**0.00**	0.20	0.20	1.105	
Low-Range Gas						
Mid-Range Gas		**10.68**	10.80	0.12	0.663	
High-Range Gas		**18.10**	17.90	0.20	1.105	

Run #: 1 Gas Type: CO2 Span: 18.1	Analyzer Response	Initial Values		Final Values		Drift % of Span
		System Response	System Cal. Bias % of Span	System Response	System Cal. Bias % of Span	
Zero Gas	0.20	0.30	0.55	-0.10	-1.66	-2.21
Upscale Gas	10.80	10.50	-1.66	10.60	-1.10	0.55

Run #: 2 Gas Type: CO2 Span: 18.1	Analyzer Response	Initial Values		Final Values		Drift % of Span
		System Response	System Cal. Bias % of Span	System Response	System Cal. Bias % of Span	
Zero Gas	0.20	-0.10	-1.66	0.00	-1.10	0.55
Upscale Gas	10.80	10.60	-1.10	10.40	-2.21	-1.10

Run #: 3 Gas Type: CO2 Span: 18.1	Analyzer Response	Initial Values		Final Values		Drift % of Span
		System Response	System Cal. Bias % of Span	System Response	System Cal. Bias % of Span	
Zero Gas	0.20	0.00	-1.10	-0.20	-2.21	-1.10
Upscale Gas	10.80	10.40	-2.21	10.40	-2.21	0.00

Client	US Steel	Test Date	12/9/2011
	Lorain Tubular	Project #	11-412
Source Identification	Austentizing Furnace	Operator	stiles

Calibration Data For Sampling Runs: 1- Gas Type: O2 Span: 22.4	Cylinder Number	Cylinder Value % or PPM	Analyzer Response	Absolute Difference % or PPM	Difference % of Span	
Zero Gas		**0.00**	0.10	0.10	0.446	
Low-Range Gas						
Mid-Range Gas		**11.07**	11.10	0.03	0.134	
High-Range Gas		**22.40**	22.40	0.00	0.000	

Run #: 1 Gas Type: O2 Span: 22.4	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	0.10	0.00	-0.45	0.00	-0.45	0.00
Upscale Gas	11.10	11.00	-0.45	10.70	-1.79	-1.34

Run #: 2 Gas Type: O2 Span: 22.4	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	0.10	0.00	-0.45	-0.10	-0.89	-0.45
Upscale Gas	11.10	10.70	-1.79	10.60	-2.23	-0.45

Run #: 3 Gas Type: O2 Span: 22.4	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	0.10	-0.10	-0.89	-0.10	-0.89	0.00
Upscale Gas	11.10	10.60	-2.23	10.60	-2.23	0.00

Client	US Steel	Test Date	12/9/2011
	Lorain Tubular	Project #	11-412
Source Identification	Tempering Furnace	Operator	stiles

Calibration Data For Sampling Runs: 1- Gas Type: NOx Span: 100.4	Cylinder Number	Cylinder Value % or PPM	Analyzer Response	Absolute Difference % or PPM	Difference % of Span	
Zero Gas		**0.00**	0.10	0.10	0.100	
No2 to No Converter Check		**43.92**	40.12	-3.80	91.35%	**PASS**
Mid-Range Gas		**48.32**	48.80	0.48	0.478	
High-Range Gas		**100.40**	100.90	0.50	0.498	

Run #: 1 Gas Type: NOx Span: 100.4	Analyzer Response	Initial Values		Final Values		Drift % of Span
		System Response	System Cal. Bias % of Span	System Response	System Cal. Bias % of Span	
Zero Gas	0.10	0.40	0.30	2.60	2.49	2.19
Upscale Gas	48.80	47.00	-1.79	48.50	-0.30	1.49

Run #: 2 Gas Type: NOx Span: 100.4	Analyzer Response	Initial Values		Final Values		Drift % of Span
		System Response	System Cal. Bias % of Span	System Response	System Cal. Bias % of Span	
Zero Gas	0.10	2.60	2.49	2.10	1.99	-0.50
Upscale Gas	48.80	48.50	-0.30	47.50	-1.29	-1.00

Run #: 3 Gas Type: NOx Span: 100.4	Analyzer Response	Initial Values		Final Values		Drift % of Span
		System Response	System Cal. Bias % of Span	System Response	System Cal. Bias % of Span	
Zero Gas	0.10	2.10	1.99	3.00	2.89	0.90
Upscale Gas	48.80	47.50	-1.29	48.70	-0.10	1.20

Client	US Steel	Test Date	12/9/2011
	Lorain Tubular	Project #	11-412
Source Identification	Tempering Furnace	Operator	stiles

Calibration Data For Sampling Runs: 1- Gas Type: CO2 Span: 18.1	Cylinder Number	Cylinder Value % or PPM	Analyzer Response	Absolute Difference % or PPM	Difference % of Span	
Zero Gas		**0.00**	-0.10	0.10	0.552	
Low-Range Gas						
Mid-Range Gas		**10.68**	10.80	0.12	0.663	
High-Range Gas		**18.10**	18.40	0.30	1.657	

Run #: 1 Gas Type: CO2 Span: 18.1	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	-0.10	0.00	0.55	0.20	1.66	1.10
Upscale Gas	10.80	10.40	-2.21	10.90	0.55	2.76

Run #: 2 Gas Type: CO2 Span: 18.1	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	-0.10	0.20	1.66	0.10	1.10	-0.55
Upscale Gas	10.80	10.90	0.55	10.90	0.55	0.00

Run #: 3 Gas Type: CO2 Span: 18.1	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	-0.10	0.10	1.10	0.00	0.55	-0.55
Upscale Gas	10.80	10.90	0.55	10.90	0.55	0.00

Client	US Steel	Test Date	12/9/2011
	Lorain Tubular	Project #	11-412
Source Identification	Tempering Furnace	Operator	stiles

Calibration Data For Sampling Runs: 1- Gas Type: O2 Span: 22.4	Cylinder Number	Cylinder Value % or PPM	Analyzer Response	Absolute Difference % or PPM	Difference % of Span	
Zero Gas		**0.00**	-0.10	0.10	0.446	
Low-Range Gas						
Mid-Range Gas		**11.07**	11.20	0.13	0.580	
High-Range Gas		**22.40**	22.40	0.00	0.000	

Run #: 1 Gas Type: O2 Span: 22.4	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	-0.10	0.04	0.63	0.10	0.89	0.27
Upscale Gas	11.20	10.78	-1.88	10.80	-1.79	0.09

Run #: 2 Gas Type: O2 Span: 22.4	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	-0.10	0.10	0.89	0.10	0.89	0.00
Upscale Gas	11.20	10.80	-1.79	10.90	-1.34	0.45

Run #: 3 Gas Type: O2 Span: 22.4	Analyzer Response	Initial Values System Response	Initial Values System Cal. Bias % of Span	Final Values System Response	Final Values System Cal. Bias % of Span	Drift % of Span
Zero Gas	-0.10	0.10	0.89	0.10	0.89	0.00
Upscale Gas	11.20	10.90	-1.34	10.90	-1.34	0.00

Grace Consulting, Inc.
EPA Method 5
522 Series Meter Box Calibration
Calibration Orifice Method
English Meter Box Units, English K' Factor

Date:	11/30/2011
Model:	APEX
Serial:	12A

Barometric Pressure:	29.89	(in Hg)
Theoretical Critical Vacuum:	14.10	(in Hg)

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

DRY GAS METER READINGS							Critical Orifice Readings					
										AMBIENT TEMPERATURE		
dH (in H2O)	Time (min)	Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	Temp Initial (deg F)	Temp Final (deg F)	Orifice Serial #	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
0.57	22.2	652.200	662.565	10.365	63	68	48	0.3449	21	70	70	70
1.00	16.4	662.600	672.732	10.132	68	71	55	0.4595	20	70	70	70
1.70	12.7	672.800	682.872	10.072	71	72	63	0.5958	17	70	70	70.0
3.20	9.2	682.900	693.015	10.115	72	73	73	0.8215	15	70	71	70.5

CORRECTED VOLUME	
DRY GAS METER Vm(std) (cu ft)	ORIFICE Vcr(std) (cu ft)
10.414	9.941
10.114	9.784
10.033	9.824
10.094	9.808

DRY GAS METER CALIBRATION FACTOR Y	
Value	Variation
0.955	-0.014
0.967	-8E-04
0.979	0.011
0.972	0.0035
Average	0.968

ORIFICE CALIBRATION FACTOR dH@	
Value (in H20)	Variation (in H20)
1.599	0.009
1.580	-0.010
1.598	0.008
1.584	-0.007
Average	1.590

Orifice for Calc.
2.67332

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +-0.2.

SIGNED: [signature] Date: 11-30-11

$$V_{m(std)} = 17.64\,(V_m)\frac{P_b + \frac{\Delta H}{13.6}}{t_m + 460}$$

$$V_{cr(std)} = K'\frac{P_b\theta}{\sqrt{t_{amb} + 460}}$$

$$Y = \frac{V_{cr(std)}}{V_{m(std)}}$$

$$\Delta H_{@} = \Delta H\left(\frac{.75\theta}{V_{cr(std)}}\right)^2$$

Grace Consulting, Inc.
EPA Method 5
522 Series Meter Box Calibration
Calibration Orifice Method
English Meter Box Units, English K' Factor

Date:	9/9/2011
Model:	Apex
Serial:	20AO

Barometric Pressure:	29.90	(in Hg)
Theoretical Critical Vacuum:	14.10	(in Hg)

IMPORTAI For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
IMPORTAI The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

DRY GAS METER READINGS							Critical Orifice Readings			AMBIENT TEMPERATURE		
dH (in H2O)	Time (min)	Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	Temp Initial (deg F)	Temp Final (deg F)	Orifice Serial #	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
0.70	24.1	727.500	738.162	10.662	71	71	48	0.3449	19	69	70	69.5
1.10	18	738.200	748.771	10.571	71	72	55	0.4595	18	70	71	70.5
1.90	13.4	748.800	758.810	10.010	72	72	63	0.5958	15	71	71	71
3.40	11.3	758.900	770.235	11.335	72	73	73	0.8215	12	71	71	71

CORRECTED VOLUME	
DRY GAS METER Vm(std) (cu ft)	ORIFICE Vcr(std) (cu ft)
10.609	10.801
10.519	10.737
9.970	10.359
11.321	12.045

DRY GAS METER CALIBRATION FACTOR Y	
Value	Variation
1.018	-0.017
1.021	-0.0147
1.039	0.0035
1.064	0.0285

Average 1.035

ORIFICE CALIBRATION FACTOR dH@	
Value (in H20)	Variation (in H20)
1.960	0.168
1.739	-0.054
1.788	-0.004
1.683	-0.110

Average 1.793

Orifice for Calc.
3.333483

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +-0.2.

SIGNED: [signature] Date: 9-9-11

$$V_{m(std)} = 17.64\,(V_m)\frac{P_b + \frac{\Delta H}{13.6}}{t_m + 460}$$

$$V_{cr(std)} = K'\frac{P_b\theta}{\sqrt{t_{amb} + 460}}$$

$$Y = \frac{V_{cr(std)}}{V_{m(std)}}$$

$$\Delta H_{@} = \Delta H\left(\frac{.75\theta}{V_{cr(std)}}\right)^2$$

Grace Consulting, Inc.
EPA Method 5
Post Test Calibration
Calibration Orifice Method
English Meter Box Units, English K' Factor

Date:	12/22/2011
Model:	Apex
Serial:	20AO

Barometric Pressure:	30.07	(in Hg)
Theoretical Critical Vacuum:	14.18	(in Hg)

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

DRY GAS METER READINGS							Critical Orifice Readings					
										AMBIENT TEMPERATURE		
dH (in H2O)	Time (min)	Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	Temp Initial (deg F)	Temp Final (deg F)	Orifice Serial #	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
1.8	13.70	948.500	958.582	10.082	59	61	63	0.5958	15	63	64	63.5
1.8	13.60	958.600	968.655	10.055	61	63	63	0.5958	15	64	64	64
1.8	13.80	968.700	978.85	10.150	63	65	63	0.5958	15	64	64	64

CORRECTED VOLUME	
DRY GAS METER Vm(std) (cu ft)	ORIFICE Vcr(std) (cu ft)
10.330	10.727
10.262	10.644
10.320	10.801

DRY GAS METER CALIBRATION FACTOR Y	
Value	Variation
1.039	-0.002
1.037	-0.0036
1.047	0.0058
Average	1.041

ORIFICE CALIBRATION FACTOR dH@	
Value (in H20)	Variation (in H20)
1.651	-0.001
1.653	0.001
1.653	0.001
Average	1.652

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +-0.2.

SIGNED: D Bailey Date: 12-22-11

$$V_{m(std)} = 17.64\,(V_m)\frac{P_b + \frac{\Delta H}{13.6}}{t_m + 460}$$

$$V_{cr(std)} = K'\frac{P_b\theta}{\sqrt{t_{amb} + 460}}$$

$$Y = \frac{V_{cr(std)}}{V_{m(std)}}$$

$$\Delta H_@ = \Delta H\left(\frac{.75\theta}{V_{cr(std)}}\right)^2$$

PITOT CALIBRATION

Pitot Tube Assembly		Post Calibration	
Pitot #	new	Visual Inspection	OK
Pitot Coefficient:	0.84	Recalibrated	N/A
		Adjusted Cp	N/A
Pitot #	new	Visual Inspection	OK
Pitot Coefficient:	0.84	Recalibrated	N/A
		Adjusted Cp	N/A

Airgas

Airgas Speciality Gases
12722 S. Wentworth Ave.
Chicago, IL 60628
(773) 785-3000 Fax: (773) 785-1928
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0060	Reference Number:	54-124288321-1
Cylinder Number:	CC112270	Cylinder Volume:	129 Cu.Ft.
Laboratory:	ASG - Chicago - IL	Cylinder Pressure:	2016 PSIG
PGVP Number:	B12011	Valve Outlet:	660
		Analysis Date:	Nov 04, 2011

Expiration Date: May 04, 2012

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NITROGEN DIOXIDE	44.00 PPM	43.92 PPM	G1	+/- 2%
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
GMIS/NO2	124233681115	CC283668	61.18PPM NITROGEN DIOXIDE/	Mar 07, 2013

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
(CH-3) ECO PHYSICS CLD822S	Chemiluminescence	Oct 13, 2011

Triad Data Available Upon Request

Permanent Notes:OXYGEN ADDED TO MAINTAIN STABILITY

Notes:

Approved for Release

2607

Airgas

Airgas Great Lakes
2009 Bellaire Ave.
Royal Oak, MI 48067
(248) 399-9150 Fax: (248) 584-2540
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Customer:	Oakwood		
Part Number:	E02NI99E15A0147	Reference Number:	32-400020316-1
Cylinder Number:	XC024563B	Cylinder Volume:	144 Cu.Ft.
Laboratory:	MIC - Royal Oak-32 (SAP) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B62011	Valve Outlet:	660
Gas Code:	NO	Analysis Date:	Sep 28, 2011

Expiration Date: Sep 28, 2013

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NITRIC OXIDE	50.00 PPM	48.32 PPM	G1	+/- 1% NIST Traceable
NITROGEN	Balance			
Total oxides of nitrogen		49.45 PPM		For Reference Only

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	09060914	CC268539	95.66PPM NITRIC OXIDE/NITROGEN	Jan 20, 2015
NTRM	11060521	CC331287	101.2PPM NITRIC OXIDE/NITROGEN	Feb 16, 2017

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
E/N 54, 100ppmFS NO, Nicolet 6700	Fourier Transform Infrared (FTIR)	Sep 16, 2011

Triad Data Available Upon Request

2626

Notes:

Approved for Release

Airgas

Airgas Great Lakes, Inc.
2009 Bellaire Ave.
Royal Oak, MI 48067
Ph: (248) 399-9150
Fax: (248) 584-2540
http://www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Customer:	BROOK PARK		
Part Number:	E02NI99E15A3615	Reference Number:	32-112265138-1
Cylinder Number:	CC221446	Cylinder Volume:	144 Cu.Ft.
Laboratory:	MIC - Royal Oak-32 - MI	Cylinder Pressure:	2015 PSIG
Analysis Date:	Apr 26, 2011	Valve Outlet:	660

Expiration Date: Apr 26, 2013

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NITRIC OXIDE	100.0 PPM	100.4 PPM	G1	+/- 1% NIST Traceable
NITROGEN	Balance			
Total oxides of nitrogen		100.5 PPM		For Reference Only

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	09060902	CC267924	95.66PPM NITRIC OXIDE/NITROGEN	Jan 20, 2015

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
E/N 54, 100ppmFS NO, Nicolet 6700	Fourier Transform Infrared (FTIR)	Mar 30, 2011

Triad Data Available Upon Request

Notes:

Approved for Release

Airgas

Airgas Great Lakes
2009 Bellaire Ave.
Royal Oak, MI 48067
(248) 399-9150 Fax: (248) 584-2540
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Customer:	OAKWOOD		
Part Number:	E03NI78E15A42E4	Reference Number:	32-112305226-1
Cylinder Number:	CC312631	Cylinder Volume:	151 Cu.Ft.
Laboratory:	MIC - Royal Oak-32 - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B62011	Valve Outlet:	590
Analysis Date:	Jun 20, 2011		

Expiration Date: Jun 20, 2014

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
CARBON DIOXIDE	10.50 %	10.68 %	G1	+/- 1% NIST Traceable
OXYGEN	11.00 %	11.07 %	G1	+/- 1% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	9060606	CC262087	9.921% CARBON DIOXIDE/NITROGEN	Apr 10, 2013
NTRM	98051110	SG9168292BAL	9.507% OXYGEN/NITROGEN	Dec 01, 2015

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
E/N 173, 10%FS CO2, SIEMENS ULTRAMAT 6	Nondispersive Infrared(NDIR)	Jun 01, 2011
E/N 51, 25%FS O2, Rosemont 755R	Paramagnetic (Para)	Jun 13, 2011

Triad Data Available Upon Request

Notes:

Approved for Release

2500

SPECIALTY GASES OF AMERICA, INC.
AMERICAN INDUSTRIAL GASES, INC.
AMERICAN RARE GASES, INC.

6055 BRENT DR. TOLEDO, OH 43611
419-729-7732 FAX 419-729-2411

THE AMERICAN GAS GROUP

www.americangasgroup.com

ANALYTICAL REPORT

Certificate ID:	070209034	**Date:**	7/2/2009
Customer Name:	Grace Consulting, Wellington		
Customer Address:	510 Dickson St.		
	Wellington OH 44090		
Purchase Order:	6110901	**Work Order:**	090442-02
Lot Number:	0615HA09	**Product Name:**	3-Component Mixture, EPA Protocol
Size:	31A	**Pressure:**	2015 psig @ 70 Deg F
Content:	N/A		
Serial #:	EB0002922		
Analysis Date:	7/2/2009		
Shelf Life:	36 months	**Expiration Date:**	7/2/2012

Component	Nominal	Actual	Accuracy	Method
Carbon Dioxide	18.0%	18.1%	+/- 1% rel	GC-TCD
Oxygen	22.5%	22.4%	+/- 1% rel	Paramagnetic
Nitrogen	Balance	Balance		

REFERENCE STANDARD	Std Type	Std #	Cyl #	Concentration	Exp Date
	GMIS	0828HF08	CC275802	17.47	1/2/2011
	GMIS	0604JL09	EB0001025	25.1500	6/3/2011

INSTRUMENTATION	Instrument / ID	Component
	GOWMAC-580 TCD	CO2
	Rosemount 755R	O2

Note: * ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS - SEPTEMBER 1997:G1
* DO NOT USE STANDARD WHEN PRESSURE IS BELOW 150 PSIG

2062

Protocal
Specialty Gases of America, Inc

Issued by: Josh Jones

U.S. Steel - Lorain Tubular Operations

Criteria Pollutant Emissions

Emissions Unit: P049	Austenitizing furnace
Operating Scenario:	Normal Operation
Inventory Year:	est 2010

Operating Schedule

	Hr/Day	Day/Wk	Wks/Yr	Hrs/Yr	
Potential Schedule	24	7	52	8760	
Actual Schedule				4380	estimation

Maximum Capacity and Fuel Data

Maximum Capacity	62.40	MMBtu/hr	
Fuel		Natural Gas	
Fuel Heating Value		1020	Btu/scf

Fuel Usage

6.12E-02	MMcuft/hour Natural Gas
535.910	MMcuft/year Natural Gas

Combustion Air Emissions

	Potential Emissions		Actual Emissions	
Pollutant	**lb/hr**	**tpy**	**lb/hr**	**tpy**
Carbon Monoxide	5.14	22.51	5.14	11.25
Lead	3.06E-05	1.34E-04	3.06E-05	6.70E-05
Nitrogen Oxides (NOx)	4.99	21.86	4.99	10.93
Particulate Matter (PM), Total	0.46	2.04	0.46	1.02
Particulate Matter < 2.5 Microns (PM2.5), Total	0.116	0.51	0.116	0.25
Sulfur dioxide	0.037	0.161	0.037	0.080
Volatile Organic Compounds (VOC)	0.34	1.47	0.34	0.74
Organic Compounds (OC)	0.67	2.95	0.67	1.47

Note: Potential hourly emissions calculated by multiplying (Maximum Capacity MMBTU/hr) X (1MMCF/1020 MMBTU) X (Emission Factors LB/MMCF)
Note: Actual hourly emissions calculated by multiplying (NG usage MMcuft/hr) X (Emission Factors LB/MMCF)
Note: Two different calculations same results.

Combustion Emissions Factors

Emission Factor Units: lb/MMcuft Natural Gas

Pollutant	Emission Factor	Determination Method	Emission Factor Data Source
Carbon Monoxide (CO)	84.00	EPA Emission Factor	USEPA. 1995. AP-42, Fifth Edition, Volume I, Chapter 1, Section 1.4, Natural Gas Combustion. Revised July, 1998.
Lead (Lb)	5.00E-04	EPA Emission Factor	Ibid
Particulate Matter (PM/PM10), Total	7.60	EPA Emission Factor	Ibid

Particulate Matter < 2.5 Microns,	1.90	EPA Emission Factor	Ibid
Sulfur dioxide (SO2)	0.6000	EPA Emission Factor	Ibid
Volatile Organic Compounds (VOC)	5.500	EPA Emission Factor	Ibid
Organic Compounds (OC)	11.000	EPA Emission Factor	Ibid
Nitrogen Oxides (NOx)	81.60	EPA Emission Factor	Equipment vendor guarantee

Notes:
Natural gas emission factors obtained from Section 1.4, AP-42 5th edition, July 1998.
PM includes both filterable and condensable portions.
Based on AP-42 guidance, all PM is assumed to PM 1.0.

U.S. Steel - Lorain Tubular Operations

Criteria Pollutant Emissions

Emissions Unit: P050	Tempering furnace
Operating Scenario:	Normal Operation
Inventory Year:	est 2010

Operating Schedule

	Hr/Day	Day/Wk	Wks/Yr	Hrs/Yr	
Potential Schedule	24	7	52	8760	
Actual Schedule				4380	estimation

Maximum Capacity and Fuel Data

Maximum Capacity	34.00	MMBtu/hr	
Fuel		Natural Gas	
Fuel Heating Value		1020	Btu/scf

Fuel Usage

3.33E-02	MMcuft/hour Natural Gas
292.000	MMcuft/year Natural Gas

Combustion Air Emissions

	Potential Emissions		Actual Emissions	
Pollutant	**lb/hr**	**tpy**	**lb/hr**	**tpy**
Carbon Monoxide	2.80	12.26	2.80	6.13
Lead	1.67E-05	7.30E-05	1.67E-05	3.65E-05
Nitrogen Oxides (NOx)	2.72	11.91	2.72	5.96
Particulate Matter (PM), Total	0.25	1.11	0.25	0.55
Particulate Matter < 2.5 Microns (PM2.5), Total	0.063	0.28	0.063	0.14
Sulfur dioxide	0.020	0.088	0.020	0.044
Volatile Organic Compounds (VOC)	0.18	0.80	0.18	0.40
Organic Compounds (OC)	0.37	1.61	0.37	0.80

Note: Potential hourly emissions calculated by multiplying (Maximum Capacity MMBTU/hr) X (1MMCF/1020 MMBTU) X (Emission Factors LB/MMCF)

Note: Actual hourly emissions calculated by multiplying (NG usage MMcuft/hr) X (Emission Factors LB/MMCF)
Note: Two different calculations same results.

Combustion Emissions Factors

Emission Factor Units: lb/MMcuft Natural Gas

Pollutant	Emission Factor	Determination Method	Emission Factor Data Source
Carbon Monoxide (CO)	84.00	EPA Emission Factor	USEPA. 1995. AP-42, Fifth Edition, Volume I, Chapter 1, Section 1.4, Natural Gas Combustion. Revised July, 1998.
Lead (Lb)	5.00E-04	EPA Emission Factor	Ibid
Particulate Matter (PM/PM10), Total	7.60	EPA Emission Factor	Ibid
Particulate Matter < 2.5 Microns,	1.90	EPA Emission Factor	Ibid
Sulfur dioxide (SO2)	0.6000	EPA Emission Factor	Ibid
Volatile Organic Compounds (VOC)	5.500	EPA Emission Factor	Ibid
Organic Compounds (OC)	11.000	EPA Emission Factor	Ibid
Nitrogen Oxides (NOx)	81.60	EPA Emission Factor	Equipment vendor guarantee

Notes:

Natural gas emission factors obtained from Section 1.4, AP-42 5th edition, July 1998.
PM includes both filterable and condensable portions.
Based on AP-42 guidance, all PM is assumed to PM 1.0.

NO_x Stack Test 12/9/11
US Steel, 0247080961

P049 | P050

Run #1

13199400 | 8541320
- 13181930 | - 8533140
17,470 ft^3 | 8,180 ft^3

P049 $17{,}470\,ft^3 \; \frac{1020\,BTU}{ft^3} \; \frac{1\,MMBTU}{10^6\,BTU} = 17.8$ MMBTU/hr

P050 $8{,}180\,ft^3 \; \frac{1020\,BTU}{ft^3} \; \frac{1\,MMBTU}{10^6\,BTU} = 8.34$ MMBTU/hr

Run #2 P049 | P050

13222900 | 8553490
-13208720 | -8545400
14,180 ft^3 | 8090 ft^3

P049 $14{,}180\,ft^3 \; \frac{1020\,BTU}{ft^3} \; \frac{1\,MMBTU}{10^6\,BTU} = 14.46$ MMBTU/hr

P050 $8090\,ft^3 \; \frac{1020\,BTU}{ft^3} \; \frac{1\,MMBTU}{10^6\,BTU} = 8.25$ MMBTU/hr

Run #3 P049 | P050

13250000 | 8564900
- 13231190 | - 8557180
18,810 ft^3 | 7,720 ft^3

P049 $18{,}810\,ft^3 \; \frac{1020\,BTU}{ft^3} \; \frac{1\,MMBTU}{10^6\,BTU} = 19.2$ MMBTU/hr

P050 7,720 ~~8.25~~ $ft^3 \; \frac{1020\,BTU}{ft} \; \frac{1\,MMBTU}{10^6\,BTU} = 7.87$ MMBTU/hr

Public Notice
Ohio Environmental Protection Agency
Draft State Implementation Plan
NOx Reasonably Available Control Technology (RACT)
for U. S. Steel Seamless Tubular Operations, LLC (Facility ID 0247080961)

Lorain County

Notice is hereby given that the Director of the Ohio Environmental Protection Agency, (Ohio EPA) is submitting to the United States Environmental Protection Agency (U.S. EPA) Reasonably Available Control Technology (RACT) for U. S. Steel Seamless Tubular Operations, LLC (Facility ID 0247080961) for approval into Ohio's state implementation plan (SIP) for the 2015 ozone National Ambient Air Quality Standard (NAAQS).

On March 17, 2025, Ohio submitted a revision to Ohio's SIP to address RACT requirements for the 2015 8-hour ozone NAAQS. As noted in this submittal, OAC rule 3745-110-03(J) requires facilities that have the potential to emit of fifty tons per year or more, but less than one hundred tons per year of nitrogen oxides (NOx) and are located in nonattainment counties to submit a RACT study if they are not subject to the NOx RACT limits in OAC rule 3745-110-03(A) to OAC rule 3745-110-03(G), the exemptions under OAC rule 3745-110-03(K), or that are subject to the aforementioned presumptive NOx RACT limits but claim that they are technically infeasible or economically unreasonable to achieve.

Ohio is now submitting source-specific NOx RACT for U. S. Steel Seamless Tubular Operations, LLC (Facility ID 0247080961) for approval into Ohio's SIP. This facility is located in the Cleveland 2015 ozone maintenance area and has no prior existing source-specific RACT established in OAC rule 3745-110-03.

The updated RACT Study was submitted per OAC rule 3745-110-03(J). Ohio has determined that the updated RACT study, along with supplemental information submitted subsequently, is sufficient to justify the continued use of the existing NOx emission limits pursuant to OAC rule 3745-31-05(D) proposed by the facility to act as RACT under the 2015 ozone standard.

Ohio EPA is now requesting approval of the proposed RACT for U. S. Steel Seamless Tubular Operations, LLC into Ohio's SIP.

Ohio EPA is seeking public comment to satisfy U.S. EPA requirements for public involvement in SIP related activities in accordance with 40 CFR 51.102.

The public comment period will run until October 5, 2026. Written comments should be submitted at: https://ohioepa.commentinput.com - Search by entering the permit #

(P0141328 for U. S. Steel Seamless Tubular Operations, LLC) in the "Search Projects" search box.

A public hearing on this action may be requested by contacting Kathryn Jobe at 614-728-0671 or kathryn.jobe@epa.ohio.gov no later than 30 days from the draft public notice. If a public hearing is requested, a new notification will be published to identify the time and location of the public hearing. The public hearing will be held at least 30 days after the date of the new notification.

All interested persons are entitled to comment on these changes. All comments submitted to the above address by the close of business 30 days from when the draft public notice is issued will be considered by Ohio EPA prior to final action on this action. Written statements submitted after this time period may be considered as time and circumstances permit but will not be part of the official record.

Questions or comments about this document should be directed to Kathryn Jobe at 614-728-0671 or kathryn.jobe@epa.ohio.gov.

DATE

Ms. Anne Vogel
Regional Administrator
U.S. EPA, Region 5
77 West Jackson Blvd.
Chicago, Illinois 60604

Re: Revision to Ohio's Reasonably Available Control Technology (RACT) State Implementation Plan for the 2015 Ozone National Ambient Air Quality Standards – Source-Specific Nitrogen Oxides (NOx*)* RACT for U. S. Steel Seamless Tubular Operations, LLC (Facility ID 0247080961)

Dear Administrator Vogel:

On March 17, 2025, Ohio submitted a revision to Ohio's State Implementation Plan (SIP) to address Reasonably Available Control Technology (RACT) requirements for the 2015 8-hour ozone National Ambient Air Quality Standards (NAAQS) for areas classified as serious. As noted in this submittal, Ohio EPA adopted requirements in OAC rule 3745-110-04 for facilities in the nonattainment areas that emit fifty tons per year or more, but less than one hundred tons per year of NOx from sources not controlled by the presumptive NOx RACT limits in OAC rule 3745-110-03(A) to OAC rule 3745-110-03(G), the exemptions under OAC rule 3745-110-03(K), or that are subject to the aforementioned presumptive NOx RACT limits but claim that they are technically infeasible or economically unreasonable to achieve to submit an updated RACT study within one year of the effective date of the rule. Upon review of the RACT study, Ohio EPA evaluated if the RACT proposed by the facility is appropriate to satisfy RACT requirements under the 2015 ozone standard.

Ohio is now submitting source-specific NOx RACT for U. S. Steel Seamless Tubular Operations, LLC (Facility ID 0247080961) for approval into Ohio's SIP. This facility is located in the Cleveland 2015 ozone maintenance area and has no prior existing source-specific RACT established in OAC rule 3745-110-03.

The updated NOx RACT Study was submitted per OAC rule 3745-110-03. Ohio has determined that the updated RACT study, along with supplemental information submitted subsequently, is sufficient to justify the continued use of the existing NOx emission limits pursuant to OAC rule 3745-31-05(D) proposed by the facility to act as RACT under the 2015 ozone standard. The RACT study is provided in Appendix A, and the permit that incorporated RACT is provided as Appendix B. Within the permit, we have highlighted the terms and conditions associated with RACT and request only those provisions are subject to this SIP revision request. Appendix C provides the permit strategy write-up for the permit.

Ohio held a public comment period on Ohio's RACT determination from September 3 to October 5, 2026. Appendix D contains the public notice. ***[Ohio's response to comments received during the public comment period is in Appendix E/No comments were received during the public comment period].***

This SIP does not include the relaxation of any existing requirements and therefore will not interfere with the attainment or maintenance of the NAAQS in accordance with section 110(l) of the CAA.

Ohio EPA is now requesting approval of the proposed RACT for U. S. Steel Seamless Tubular Operations, LLC into Ohio's SIP.

Ohio EPA is submitting this SIP via U.S. EPA's State Planning Electronic Collaboration System (SPeCS). If you have questions, please contact Jennifer Van Vlerah in our Division of Air Pollution Control at (614) 644-3696.

Sincerely,

John Logue
Director

Cc: Bob Hodanbosi, Chief, Division of Air Pollution Control, Ohio EPA

Enclosures