Mr. Dennis Sharp
United States Penitentiary
4200 Bureau Road North
Terre Haute, Indiana 47808

July 21, 2003

Re: 167-15710
Significant Source Modification to:
Part 70 permit No.: T167-6106-00019

Dear Mr. Sharp:

United States Penitentiary was issued Part 70 operating permit T167-61060-00019 on July 19, 2001 for a maximum security prison. An application to modify the source was received on June 6, 2002. Pursuant to 326 IAC 2-7-10.5 the following emission units are approved for construction at the source:

(a) Four (4) natural gas fired boilers, using No. 2 fuel oil for backup, identified as: B-UP-1 with a maximum heat input rate of 42 million (MM) Btu per hour, B-UP-2 with a maximum heat input rate of 42 million (MM) Btu per hour, B-UP-3 with a maximum heat input rate of 42 million (MM) Btu per hour, and B-UP-4 with a maximum heat input rate of 42 million (MM) Btu per hour. Emissions exhausting to the following stacks: 11, 12, 13, and 14, respectively.

(b) Four (4) No. 2 fuel fired emergency generators, identified as: EG-1 with a maximum heat input rate of 11.55 million (MM) Btu per hour, EG-2 with a maximum heat input rate of 11.55 million (MM) Btu per hour, EG-3 with a maximum heat input rate of 11.55 million (MM) Btu per hour, and EG-4 with a maximum heat input rate of 11.55 million (MM) Btu per hour. Emissions exhausting to the following stacks: 15, 16, 17, and 18, respectively.

The following construction conditions are applicable to the proposed project:

General Construction Conditions

1. The data and information supplied with the application shall be considered part of this source modification approval. Prior to any proposed change in construction which may affect the potential to emit (PTE) of the proposed project, the change must be approved by Vigo County Air Pollution Control (VCAPC) and the Office of Air Quality (OAQ).

2. This approval to construct does not relieve the permittee of the responsibility to comply with the provisions of the Indiana Environmental Management Law (IC 13-11 through 13-20; 13-22 through 13-25; and 13-30), the Air Pollution Control Law (IC 13-17) and the rules promulgated thereunder, as well as other applicable local, state, and federal requirements.

3. Effective Date of the Permit
Pursuant to IC 13-15-5-3, this approval becomes effective upon its issuance.

4. Pursuant to 326 IAC 2-1.1-9 and 326 IAC 2-7-10.5(i), the Commissioner may revoke this approval if construction is not commenced within eighteen (18) months after receipt of this approval or if construction is suspended for a continuous period of one (1) year or more.

5. All requirements and conditions of this construction approval shall remain in effect unless modified in a manner consistent with procedures established pursuant to 326 IAC 2.

6. Pursuant to 326 IAC 2-7-10.5(l) the emission units constructed under this approval shall not be placed into operation prior to revision of the source's Part 70 Operating Permit to incorporate the required operation conditions.

The proposed operating conditions applicable to these emission units are attached to this Source Modification approval. These proposed operating conditions shall be incorporated into the Part 70 operating permit as an administrative amendment in accordance with 326 IAC 2-7-10.5(l)(1) and 326 IAC 2-7-11.

This decision is subject to the Indiana Administrative Orders and Procedures Act - IC 4-21.5-3-5. If you have any questions on this matter call Mr. Darren Woodward at Vigo County Air Pollution Control (VCAPC), (812)462-3433, extension 15.

Sincerely,

Original Signed by George M. Needham
George M. Needham
Director
Vigo County Air Pollution Control

Attachments
DKW
cc: Mindy Hahn - IDEM
Winter Bottum - IDEM

PART 70 OPERATING PERMIT
OFFICE OF AIR QUALITY
and
VIGO COUNTY AIR POLLUTION CONTROL

United States Penitentiary
4200 Bureau Road North
Terre Haute, Indiana 47808

and

Unicor Federal Prison Industry
4200 Bureau Road North
Terre Haute, Indiana 47808

(herein known as the Permittee) is hereby authorized to operate subject to the conditions contained herein, the source described in Section A (Source Summary) of this permit.

This permit is issued in accordance with 326 IAC 2 and 40 CFR Part 70 Appendix A and contains the conditions and provisions specified in 326 IAC 2-7 as required by 42 U.S.C. 7401, et. seq. (Clean Air Act as amended by the 1990 Clean Air Act Amendments), 40 CFR Part 70.6, IC 13-15 and IC 13-17.

Operation Permit No.: T167-6106-00019	
Issued by: Janet G. McCabe, Assistant Commissioner Office of Air Management	Issuance Date: June 17, 1999

First Administrate Amendment, 167-12378 issued on September 26, 2000 (Page Affected: Page 31)
Second Administrative Amendment, 167-14559 issued on July 19, 2001 (Page Affected: Page 5)

Significant Source Modification No.: 167-15710 Significant Permit Modification No.: 167-16927	Page(s) Affected: 2, 3, 4, 5, 6, 34, 35, 36, and 40
Issued by: Original Signed by George Needham George M. Needham, Director Vigo County Air Pollution Control	Issuance Date: July 21, 2003

Indiana Department of Environmental Management
Office of Air Quality
and
Vigo County Air Pollution Control

Technical Support Document (TSD) for a Significant Source Modification and Significant Permit Modification to a Part 70 Operating Permit

Source Background and Description

Source Name:	**United States Penitentiary and Unicor Federal Prison Industry**
Source Location:	**4200 Bureau Road North, Terre Haute, Indiana 47808**
County:	**Vigo**
SIC Code:	**9223**
Operation Permit No.:	**T167-6106-00019**
Operation Permit Issuance Date:	**July 19, 2001**
Significant Source Modification No.:	**167-15710-00019**
Significant Permit Modification No.:	**167-16927-00019**
Permit Reviewer:	**Darren Woodward**

Vigo County Air Pollution Control (VCAPC) has reviewed a modification application from the United States Penitentiary and Unicor Federal Prison Industry relating to the operation of a maximum security prison.

(a) Four (4) natural gas fired boilers, using No. 2 fuel oil for backup, identified as: B-UP-1 with a maximum heat input rate of 42 million (MM) Btu per hour, B-UP-2 with a maximum heat input rate of 42 million (MM) Btu per hour, B-UP-3 with a maximum heat input rate of 42 million (MM) Btu per hour, and B-UP-4 with a maximum heat input rate of 42 million (MM) Btu per hour. Emissions exhausting to the following stacks: 11, 12, 13, and 14, respectively.

(b) Four (4) No. 2 fuel fired emergency generators, identified as: EG-1 with a maximum heat input rate of 11.55 million (MM) Btu per hour, EG-2 with a maximum heat input rate of 11.55 million (MM) Btu per hour, EG-3 with a maximum heat input rate of 11.55 million (MM) Btu per hour, and EG-4 with a maximum heat input rate of 11.55 million (MM) Btu per hour. Emissions exhausting to the following stacks: 15, 16, 17, and 18, respectively.

Source Definition

This maximum security prison consists of a source with an on-site contractor:

(a) United States Penitentiary, the primary operation, is located at, 4200 Bureau Road North, Terre Haute, Indiana; and

(b) Unicor Federal Prison Industry, the supporting operation, is located at 4200 Bureau Road North, Terre Haute, Indiana.

IDEM and VCAPC has determined the United States Penitentiary and Unicor Federal Prison Industry are under the common control of United States Penitentiary. These two operations are

considered one source due to contractural control. Therefore, the term "source" in the Part 70 documents and this Significant Source Modification refers to both, the United States Penitentiary and the Unicor Federal Prison Industry, as one source.

Existing Approvals

The source was issued a Part 70 Operating Permit (T167-6106-00019) on July 19, 2001.

Enforcement Issue

There are no enforcement actions pending.

Stack Summary

Stack ID	Operation	Height (feet)	Diameter (feet)	Flow Rate (acfm)	Temperature (^{0}F)
11	Boiler (B-UP-1)	32	2.5	13,908	422
12	Boiler (B-UP-2)	32	2.5	13,908	422
13	Boiler (B-UP-3)	32	2.5	13,908	422
14	Boiler (B-UP-4)	32	2.5	13,908	422
15	Emergency Generator (EG-1)	20	1.0	10,806	1,007
16	Emergency Generator (EG-2)	20	1.0	10,806	1,007
17	Emergency Generator (EG-3)	20	1.0	10,806	1,007
18	Emergency Generator (EG-4)	20	1.0	10,806	1,007

Recommendation

The staff recommends to the Commissioner that the Significant Source Modification be approved. This recommendation is based on the following facts and conditions:

Unless otherwise stated, information used in this review was derived from the application and additional information submitted by the applicant.

An application for the purposes of this review was received on June 6, 2002, additional information was received on July 16, July 22, and September 3, 2002.

Emission Calculations

See Appendix A of this document for detailed emissions calculations (pages 1 through 12).

Potential To Emit

Pursuant to 326 IAC 2-1.1-1(16), Potential to Emit is defined as "the maximum capacity of a stationary source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or type or amount of material combusted, stored, or processed shall be treated as part of its design if the limitation is enforceable by the U. S. EPA."

Pollutant	Potential To Emit (tons/year)
PM	10.7
PM-10	10.7

SO_2	379
VOC	1.82
CO	62.2
NO_x	107

Note: For the purpose of determining Title V applicability for particulates, PM-10, not PM, is the regulated pollutant in consideration.

HAP's	Potential To Emit (tons/year)
Benzene	0.002
Dichlorobenzene	0.001
Formaldehyde	0.055
Hexane	1.325
Toluene	0.003
Lead	0.007
Cadmium	0.002
Chromium	0.002
Manganese	0.004
Nickel	0.002
Arsenic	0.003
Beryllium	0.002
Mercury	0.002
Selenium	0.011
TOTAL	1.42

Justification for Modification

The Part 70 Operating permit is being modified through this Part 70 Significant Source Modification. This modification is being performed pursuant to 326 IAC 2-7-10.5(f)(4) which covers modifications with a potential to emit greater than or equal to twenty-five (25) tons per year of any of the following pollutants:

(A) Particulate matter (PM) or (PM10).
(B) Sulfur dioxide (SO_2).
(C) Nitrogen oxides (NO_x).
(D) Volatile organic compounds (VOC).
(E) Hydrogen sulfide (H_2S).
(F) Total reduced sulfur (TRS).
(G) Reduced sulfur compounds.
(H) Fluorides.

Actual Emissions

The following table shows the actual emissions from the source. This information reflects the 2001 OAQ emission data.

Pollutant	Actual Emissions (tons/year)
PM	0.525
PM-10	0.347
SO_2	0.067
VOC	3.12
CO	1.01
NO_x	11.4
HAP (specify)	0.00

Limited Potential to Emit

The table below summarizes the total potential to emit, reflecting all limits, of the significant emission units.

	Limited Potential to Emit (tons/year)						
Process/facility	PM	PM-10	SO_2	VOC	CO	NO_X	HAPs
four boilers and four emergency generators	1.12	1.84	39.8	0.190	2.80	11.2	0.0012/0.004
Emission Threshold	25	15	40	40	100	40	10 (single) 25 (combination)

The fuel oil usage for the four (4) Hurst Boilers and the four (4) Caterpillar Emergency Generators combined shall not exceed 927 thousand gallons (kgal) per twelve (12) consecutive month period based on a maximum allowable sulfur content of 0.5% and a heat content of 140,000 Btu per gallon of no. 2 fuel oil. This limitation is equivalent to a potential to emit of less than 40 tons of SO_2 per year. Compliance with this limit makes 326 IAC 2-2 (Prevention of Significant Deterioration) not applicable.

County Attainment Status

The source is located in Vigo County.

Pollutant	Status
PM-10	attainment
SO_2	attainment
NO_2	attainment
Ozone	attainment
CO	attainment
Lead	attainment

(a) Volatile organic compounds (VOC) are precursors for the formation of ozone. Therefore, VOC emissions are considered when evaluating the rule applicability relating to the ozone standards. Vigo County has been designated as attainment or unclassifiable for ozone. Therefore, VOC emissions were reviewed pursuant to the requirements for Prevention of Significant Deterioration (PSD), 326 IAC 2-2.

Federal Rule Applicability

(a) The four (4) Hurst Boilers (B-UP-1, B-UP-2, B-UP-3, and B-UP-4) are subject to the New Source Performance Standard, 326 IAC 12, (40 CFR 60.40c, Subpart Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units).

Pursuant to 40 CFR 60.42c(d) (Standard for sulfur dioxide)

> No owner or operator of an affected facility that combusts oil shall cause to be discharged into the atmosphere from that affected facility any gases that contain SO_2 in excess of 215 ng/J (0.50 lb/million BTU) heat input; or, as an alternative, no owner or operator of an affected facility that combusts oil in the affected facility that contains greater than 0.5 weight percent sulfur. The percent reduction requirements are not applicable to affected facilities under this paragraph.

Pursuant to 40 CFR 60.42c(h) (Standard for sulfur dioxide)

> For affected facilities firing distillate oil and having heat input capacities between 10 and 100 million BTU per hour, compliance with the emission limits or fuel oil sulfur limits under this section may be determined based on a certification from the fuel supplier as described under 40 CFR 60.48c(f)(1).

Pursuant to 40 CFR 60.42c(i) (Standard for sulfur dioxide)

> The SO2 emission limits, fuel oil sulfur limits, and percent reduction requirements under this section apply at all times, including periods of startup, shutdown, and malfunction.

Pursuant to 40 CFR 60.44c(b) (Compliance and performance test methods and procedures for sulfur dioxide)

> The first day of the initial performance test shall be scheduled within 30 days after the facility achieves the maximum production rate, but not more than 180 days after initial startup.

Pursuant to 40 CFR 60.44c(h) (Compliance and performance test methods and procedures for sulfur dioxide)

> For affected facilities subject to 40 CFR 60.42c(h)(1) where the owner or operator seeks to demonstrate compliance with the SO_2 standards based on fuel supplier certification, the performance test shall consist of the certification, the certification from the fuel supplier, as described under 40 CFR 60.48c(f)(1).

Pursuant to 40 CFR 60.46c(e) (Emission monitoring for sulfur dioxide)

> The monitoring requirements of paragraphs (a) and (d) of this section do not apply to affected facilities subject to 40 CFR 60.42c(h)(1) where the owner or operator of the affected facility seeks to demonstrate compliance with the SO2 standards based on fuel supplier certification, as described under 40 CFR 60.48c(f)(1).

Pursuant to 40 CFR 60.48c(a) (Reporting and recordkeeping requirements)

> The owner or operator of each affected facility shall submit notification of the date of construction or reconstruction, anticipated startup, and actual startup, as provided by 40 CFR 60.7. This notification shall include:
>
> (A) The design heat input capacity of the affected facility and identification of fuels to be combusted in the affected facility.

(B) If applicable, a copy of any Federally enforceable requirement that limits the annual capacity factor for any fuel or mixture of fuels under 40 CFR 60.42c or 40 CFR 60.43c.

(C) The annual capacity factor at which the owner or operator anticipates operating the affected facility based on all fuels fired and based on each individual fuel fired.

(D) Notification if an emerging technology will be used for controlling SO_2 emissions. The Administrator will examine the description of the control device and determine whether the technology qualifies as an emerging technology. In making this determination, the Administrator may require the owner or operator of the affected facility to submit additional information concerning the control device. The affected facility is subject to the provisions of 40 CFR 60.42c(a) or (b)(1), unless and until this determination is made by the Administrator.

Pursuant to 40 CFR 60.48c(b) (Reporting and recordkeeping requirements)

The owner or operator of each affected facility subject to the SO2 emission limits of 40 CFR 60.42c, or the PM or opacity limits of 40 CFR 60.43c, shall submit to the Administrator the performance test data from the initial and any subsequent performance tests and, if applicable, the performance evaluation of the CEMS using the applicable performance specifications in Appendix B.

Pursuant to 40 CFR 60.48c(d) (Reporting and recordkeeping requirements)

The owner or operator of each affected facility subject to the SO2 emission limits, fuel oil sulfur limits, or percent reduction requirements under 40 CFR 60.42c shall submit quarterly reports to the Administrator. The initial quarterly report shall be postmarked by the 30th day of the third month following the completion of the initial performance test. Each subsequent quarterly report shall be postmarked by the 30th day following the end of the reporting period.

Pursuant to 40 CFR 60.48c(e) (Reporting and recordkeeping requirements)

The owner or operator of each affected facility subject to the SO2 emission limits, fuel oil sulfur limits, or percent reduction requirements under 40 CFR 60.43c shall keep records and submit quarterly reports as required above, including the following information:

(A) Calendar dates covered in the reporting period.

(B) Each 30-day average SO2 emission rate (ng/J or lb/million BTU), or 30-day average sulfur content (weight percent), calculated during the reporting period, ending with the last 30-day period in the quarter; reasons for any noncompliance with the emission standards; and a description of corrective actions taken.

(C) If fuel supplier certification is used to demonstrate compliance, records of fuel supplier certification as described under paragraph (f)(1) of this section, as applicable. In addition to records of fuel supplier certifications, the quarterly report shall include a certified statement signed by the owner or operator of the affected facility that the records of fuel supplier certifications submitted represent all of the fuel combusted during the quarter.

Pursuant to 40 CFR 60.48c(f) (Reporting and record keeping requirements)

Fuel supplier certification shall include the following information: (for distillate oil)

1. The name of the oil supplier; and
2. A statement from the oil supplier that the oil complies with the specifications under the definition of distillate oil in 40 CFR 60.41c.

Pursuant to 40 CFR 60.48c(g) (Reporting and recordkeeping requirements)

The owner or operator of each affected facility shall record and maintain records of the amounts of each fuel combusted each day. EPA Policy may allow for this information to be kept on a monthly basis.

Pursuant to 40 CFR 60.48c(i) (Reporting and recordkeeping requirements)

All records required under this section shall be maintained by the owner or operator of the affected facility for a period of two years following the date of such record.

(b) There are no National Emission Standards for Hazardous Air Pollutants (NESHAPs)(326 IAC 14 and 40 CFR Part 63) applicable to this source.

State Rule Applicability - Entire Source

326 IAC 2-2 (PSD Minor Limit)

The oil usage for the four (4) Hurst Boilers and the four (4) Caterpillar Emergency Generators combined shall not exceed 927 thousand gallons (kgal) per twelve (12) consecutive month period based on a maximum allowable sulfur content of 0.5% and a heat content of 140,000 Btu per gallon of no. 2 fuel oil. This limitation is equivalent to a potential to emit of less than 40 tons of SO_2 per year. Compliance with this limit makes 326 IAC 2-2 (Prevention of Significant Deterioration) not applicable.

326 IAC 5-1 (Opacity Limitations)

Pursuant to 326 IAC 5-1-2 (Opacity Limitations), except as provided in 326 IAC 5-1-3 (Temporary Alternative Opacity Limitations), opacity shall meet the following, unless otherwise stated in this permit:

(a) Opacity shall not exceed an average of forty percent (40%) any one (1) six (6) minute averaging period as determined in 326 IAC 5-1-4.

(b) Opacity shall not exceed sixty percent (60%) for more than a cumulative total of fifteen (15) minutes (sixty (60) readings) as measured according to 40 CFR 60, Appendix A, Method 9 or fifteen (15) one (1) minute nonoverlapping integrated averages for a continuous opacity monitor) in a six (6) hour period.

326 IAC 1-6-3 (Preventive Maintenance Plan)

The source submitted a Preventive Maintenance Plan (PMP) in January of 2000. This PMP has been verified to fulfill the requirements of 326 IAC 1-6-3 (Preventive Maintenance Plan).

326 IAC 1-5-2 (Emergency Reduction Plans)

The source submitted an Emergency Reduction Plan (ERP) in January of 2000. The ERP was updated in January of 2001 due to a change of the Responsible Official. The ERP has been verified to fulfill the requirements of 326 IAC 1-5-2 (Emergency Reduction Plans).

State Rule Applicability - Individual Facilities

326 IAC 6-1-2 (Particulate Limitations)

Pursuant to 326 IAC 6-1-2(a), general particulate matter emitting units shall not discharge to the atmosphere gases which contain in excess of 0.03 grain per dry standard cubic foot of particulate matter.

Pursuant to 326 IAC 6-1-2(b)(2), particulate matter emissions shall not exceed 0.15 pounds per million BTU for all liquid fuel fired steam generators.

326 IAC 6-2-4 (Particulate emission limitations for sources of indirect heating)

Pursuant to 326 IAC 6-2-4 (Particulate emission limitations for sources of indirect heating) the

particulate emissions from indirect heating facilities constructed after September 21, 1983 (Boilers #1, #2, #3, #5, #6, B-UP-1, B-UP-2, B-UP-3, and B-UP-4) shall be limited to 0.236 pounds per million (MM) Btu heat input.

This limitation is based on the following equation: $Pt = 1.09/Q^{0.26}$, where Pt = pounds of particulate matter emitted per million Btu (lb/MMBtu/hr) heat input. Q = total source maximum operating capacity rating in million Btu per hour (MMBtu/hr) heat input.

326 IAC 7-1.1-2 (Sulfur Dioxide emission limits)

Pursuant to 326 IAC 7-1.1-2, all combustion units which have the potential to emit either 25 tons per year or 10 pounds per hour of Sulfur Dioxide must comply with either this provision or any unit specific limitations in 326 IAC 7-4-3 (for Vigo County). Boilers B-UP-1, B-UP-2, B-UP-3, and B-UP-4 shall comply with the specific limitation (while firing distillate oil) of 0.5 pounds of SO2 per million BTU.

Conclusion

The operation of the four (4) boilers and four (4) emergency generators shall be subject to the conditions of the attached proposed SSM No. 167-15710-00019.

Appendix A: Emissions Calculations
Commercial/Institutional/Residential Combustors (< 100 mmBtu/hr)
Emergency generators using #2 Fuel Oil

Company Name: United States Penitentiary
Address, City IN Zip: 4200 Bureau Road North, Terre Haute, IN 47808
SSM No.: 167-15710
SPM No.: 167-16927
Plt ID: 167-00019
Reviewer: Darren Woodward
Date: December 12, 2002

Potential Throughput kgals/year	S = Weight % Sulfur
	0.5
41.25	

	Pollutant					
	PM*	PM10	SO2	NOx	VOC	CO
	2.0	3.3	71 *(142.0S)*	20.0	0.34	5.0
	0.041	0.068	1.5	0.41	0.007	0.10
ors	0.165	0.272	5.86	1.65	0.028	0.413

a heating value of 140,000 Btu
hours per year.
ar) = Heat Input Capacity (MMBtu/hr) x 500 hrs/yr x 1kgal per 1000 gallon x 1 gal per 0.140 MM Btu

42, Tables 1.3-1, 1.3-2, and 1.3-3 (SCC 1-03-005-01/02/03) Supplement E 9/98 (see erata file)
e PM only. Condensable PM emission factor is 1.3 lb/kgal.
ut (kgals/ yr) x Emission Factor (lb/kgal)/2,000 lb/ton

Appendix A: Emissions Calculations
Boilers using Natural Gas Combustion Only
MM BTU/HR <100
Small Industrial Boiler
Company Name: United States Penitentiary
Address City IN Zip: 4200 Bureau Road North, Terre Haute, IN 47808
SSM No.: 167-15710
SPM No.: 167-16927
Plt ID: 167-00019
Reviewer: Darren Woodward
Date: December 12, 2002

Heat Input Capacity MMBtu/hr	Potential Throughput MMCF/yr
42.0	367.9

	Pollutant					
	PM*	PM10*	SO2	NOx	VOC	CO
Emission Factor in lb/MMCF	1.9	7.6	0.6	100.0 **see below	5.5	84.0
Potential Emission in tons/yr	0.350	1.40	0.110	18.4	1.01	15.5
Total for 4 boilers (tons/yr)	1.40	5.59	0.442	73.6	4.05	61.8

*PM emission factor is filterable PM only. PM10 emission factor is condensable and filterable PM10 combined.
**Emission Factors for NOx: Uncontrolled = 100, Low NOx Burner = 50, Low NOx Burners/Flue gas recirculation = 32

Methodology

All emission factors are based on normal firing.
MMBtu = 1,000,000 Btu
MMCF = 1,000,000 Cubic Feet of Gas
Potential Throughput (MMCF) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1 MMCF/1,000 MMBtu
Emission Factors are from AP 42, Chapter 1.4, Tables 1.4-1, 1.4-2, 1.4-3, SCC #1-02-006-02, 1-01-006-02, 1-03-006-02, and 1-03-006-03 (SUPPLEMENT D 3/98)
Emission (tons/yr) = Throughput (MMCF/yr) x Emission Factor (lb/MMCF)/2,000 lb/ton

Appendix A: Emissions Calculations
Commercial/Institutional/Residential Combustors (< 100 mmBtu/hr)
Boilers using #2 Fuel Oil

Company Name: United States Penitentiary
Address, City IN Zip: 4200 Bureau Road North, Terre Haute, IN 47808
SSM No.: 167-15710
SPM No.: 167-16927
Plt ID: 167-00019
Reviewer: Darren Woodward
Date: December 12, 2002

›acity	Potential Throughput kgals/year	S = Weight % Sulfur
	2628	0.5

	Pollutant					
	PM*	PM10	SO2	NOx	VOC	CO
›r in lb/kgal	2.0	3.3	71 *(142.0S)*	20.0	0.34	5.0
sion in tons/yr	2.63	4.34	93.3	26.3	0.447	6.57
ers (tons/yr)	10.5	17.3	373	105	1.79	26.3

2 Fuel Oil has a heating value of 140,000 Btu

ughput (kgals/year) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1kgal per 1000 gallon x 1 gal per 0.140 MM Btu

›rs are from AP 42, Tables 1.3-1, 1.3-2, and 1.3-3 (SCC 1-03-005-01/02/03) Supplement E 9/98 (see erata file)
factor is filterable PM only. Condensable PM emission factor is 1.3 lb/kgal.
/yr) = Throughput (kgals/ yr) x Emission Factor (lb/kgal)/2,000 lb/ton

Appendix A: Emissions Calculations

Commercial/Institutional/Residential Combustors (< 100 mmBtu/hr)

Boilers using #2 Fuel Oil

Company Name: United States Penitentiary

Address, City IN Zip: 4200 Bureau Road North, Terre Haute, IN 47808

SSM No.: 167-15710

SPM No.: 167-16927

Plt ID: 167-00019

Reviewer: Darren Woodward

Date: December 12, 2002

HAPs - Metals

	Arsenic	Beryllium	Cadmium	Chromium	Lead
or in lb/mmBtu	4.0E-06	3.0E-06	3.0E-06	3.0E-06	9.0E-06
sion in tons/yr	7.36E-04	5.52E-04	5.52E-04	5.52E-04	1.66E-03
sions for 4 boilers	2.94E-03	2.21E-03	2.21E-03	2.21E-03	6.62E-03

HAPs - Metals (continued)

	Mercury	Manganese	Nickel	Selenium
or in lb/mmBtu	3.0E-06	6.0E-06	3.0E-06	1.5E-05
sion in tons/yr	5.52E-04	1.10E-03	5.52E-04	2.76E-03
sions for 4 boilers	2.21E-03	4.42E-03	2.21E-03	1.10E-02

vailable in AP-42 for organic HAPs.

sions (tons/year) = Throughput (mmBtu/hr)*Emission Factor (lb/mmBtu)*8,760 hrs/yr / 2,000 lb/ton

Appendix A: Emissions Calculations
Boilers using Natural Gas Combustion Only
MM BTU/HR <100
Small Industrial Boiler
Company Name: United States Penitentiary
Address City IN Zip: 4200 Bureau Road North, Terre Haute, IN 47808
SSM No.: 167-15710
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Plt ID: 167-00019
Reviewer: Darren Woodward
Date: December 12, 2002

HAPs - Organics

	Benzene	Dichlorobenzene	Formaldehyde	Hexane	Toluene
Emission Factor in lb/MMcf	2.1E-03	1.2E-03	7.5E-02	1.8E+00	3.4E-03
Potential Emission in tons/yr	3.863E-04	2.208E-04	1.380E-02	3.311E-01	6.255E-04
Potential Emission for 4 boilers	1.55E-03	8.83E-04	5.52E-02	1.32E+00	2.50E-03

HAPs - Metals

	Lead	Cadmium	Chromium	Manganese	Nickel
Emission Factor in lb/MMcf	5.0E-04	1.1E-03	1.4E-03	3.8E-04	2.1E-03
Potential Emission in tons/yr	9.198E-05	2.024E-04	2.575E-04	6.990E-05	3.863E-04
Potential Emission for 4 boilers	3.68E-04	8.09E-04	1.03E-03	2.80E-04	1.55E-03

Methodology is the same as page 1.

The five highest organic and metal HAPs emission factors are provided above.
Additional HAPs emission factors are available in AP-42, Chapter 1.4.

Calculation Summary

Source Name: United States Penitentiary and Unicor Federal Prison Industry
Source Location: 4200 Bureau Road North, Terre Haute, Indiana 47808
County: Vigo
SIC Code: 9223
Operation Permit No.: T167-6106-00019
Operation Permit Issuance Date: July 19, 2001
Significant Source Modification No.: 167-15710-00019
Significant Permit Modification No.: 167-16927-00019
Permit Reviewer: Darren Woodward

	PM (Tons/yr)	PM10 (Tons/yr)	SO2 (Tons/yr)	NOx (Tons/yr)	VOC (Tons/yr)	CO (Tons/yr)
Boilers (nat. gas, 4 boilers)	1.40	5.59	0.441	73.6	4.05	**61.8**
Boilers (No. 2, 4 boilers)	**10.5**	**17.3**	**373**	**105**	**1.79**	26.3
Emergency generators, 500 hours (No. 2, 4 generators)	**0.165**	**0.272**	**5.86**	**1.65**	**0.028**	**0.413**
Worst Case	**10.7**	**17.6**	**379**	**107**	**1.82**	**62.2**

HAP	HAP Emissions (TPY) Natural Gas	HAP Emissions (TPY) Fuel Oil	Worst Case HAP Emissions (TPY)
Benzene	0.002		0.002
Dichlorobenzene	0.001		0.001
Formaldehyde	0.055		0.055
Hexane	1.325		1.325
Toluene	0.003		0.003
Lead	0.000	0.007	0.007
Cadmium	0.001	0.002	0.002
Chromium	0.000	0.002	0.002
Manganese	0.002	0.004	0.004
Nickel		0.002	0.002
Arsenic		0.003	0.003
Beryllium		0.002	0.002
Mercury		0.002	0.002
Selenium		0.011	0.011
Total HAPs	**1.39**	**0.035**	**1.42**

Calculation Summary

Source Name: United States Penitentiary and Unicor Federal Prison Industry
Source Location: 4200 Bureau Road North, Terre Haute, Indiana 47808
County: Vigo
SIC Code: 9223
Operation Permit No.: T167-6106-00019
Operation Permit Issuance Date: July 19, 2001
Significant Source Modification No.: 167-15710-00019
Significant Permit Modification No.: 167-16927-00019
Permit Reviewer: Darren Woodward

Calculations based on a limit of 927,000 gallons of fuel oil:

	PM (Tons/yr)	PM10 (Tons/yr)	SO2 (Tons/yr)	NOx (Tons/yr)	VOC (Tons/yr)	CO (Tons/yr)
PTE based on limit of 927,000 gallons of fuel oil	1.12	1.84	39.8	11.2	0.190	2.80

HAP	HAP Emissions (TPY) Fuel Oil	HAP Emissions (TPY) with limit of 927,000 gallons of fuel oil
Lead	0.007	0.0007
Cadmium	0.002	0.0002
Chromium	0.002	0.0002
Manganese	0.004	0.0004
Nickel	0.002	0.0002
Arsenic	0.003	0.0003
Beryllium	0.002	0.0002
Mercury	0.002	0.0002
Selenium	0.011	0.0012
Total HAPs	**0.035**	**0.004**

Appendix A: Emissions Calculations
Commercial/Institutional/Residential Combustors (< 100 mmBtu/hr)
Limiting Potential Throughput (kgals/year)
Boilers using #2 Fuel Oil

Company Name: United States Penitentiary
Address, City IN Zip: 4200 Bureau Road North, Terre Haute, IN 47808
SSM No.: 167-15710
SPM No.: 167-16927
Plt ID: 167-00019
Reviewer: Darren Woodward
Date: January 27, 2003

Heat Input Capacity MMBtu/hr	Limited Potential Throughput kgals/year	S = Weight % Sulfur
42	927	0.5

	Pollutant					
	PM*	PM10	SO2	NOx	VOC	CO
Emission Factor in lb/kgal	2.0	3.3	71 *(142.0S)*	20.0	0.34	5.0
Potential Emission for each boiler	0.232	0.382	8.23	2.32	0.039	0.579
Potential Emission for 4 boilers (tons/y	0.927	1.53	32.9	9.27	0.158	2.32

Methodology

1 gallon of No. 2 Fuel Oil has a heating value of 140,000 Btu
Potential Emissions for 4 boilers (ton/y

Emission Factors are from AP 42, Tables 1.3-1, 1.3-2, and 1.3-3 (SCC 1-03-005-01/02/03) Supplement E 9/98 (see erata file)
*PM emission factor is filterable PM only. Condensable PM emission factor is 1.3 lb/kgal.

Appendix A: Emissions Calculations
Natural Gas Combustion Only
MM BTU/HR <100
Small Industrial Boiler
Limiting Potential Throughput (MMCF/yr)

Company Name: United States Penitentiary
Address City IN Zip: 4200 Bureau Road North, Terre Haute, IN 47808
CP: 167-15710
Plt ID: 167-00019
Reviewer: Darren Woodward
Date: January 27, 2003

Heat Input Capacity MMBtu/hr	Potential Throughput MMCF/yr
42.0	747.0

	Pollutant					
	PM*	PM10*	SO2	NOx	VOC	CO
Emission Factor in lb/MMCF	1.9	7.6	0.6	100.0 **see below	5.5	84.0
Potential Emission each boiler (tons/yr	0.177	0.710	0.056	9.34	0.514	7.84
Potential Emission for 4 boilers (tons/y	0.710	2.84	0.224	37.4	2.05	31.4

*PM emission factor is filterable PM only. PM10 emission factor is condensable and filterable PM10 combined.
**Emission Factors for NOx: Uncontrolled = 100, Low NOx Burner = 50, Low NOx Burners/Flue gas recirculation = 32

Methodology

All emission factors are based on normal firing.
MMBtu = 1,000,000 Btu
MMCF = 1,000,000 Cubic Feet of Gas

Potential Throughput (MMCF) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1 MMCF/1,000 MMBtu
Emission Factors are from AP 42, Chapter 1.4, Tables 1.4-1, 1.4-2, 1.4-3, SCC #1-02-006-02, 1-01-006-02, 1-03-006-02, and 1-03-006-03

Multiple Fuel Limits Calculations

Four (4) 42 MMBtu per hour boilers

Natural Gas firing (4 boilers total):

PM	1.40 tons/yr
PM10	5.59 tons/yr
SO_2	0.441 tons/yr
NOx	73.6 tons/yr
VOC	4.05 tons/yr
CO	61.8 tons/yr

No. 2 oil firing (4 boilers total):

PM	10.5 tons/yr
PM10	17.3 tons/yr
SO_2	373 tons/yr
NOx	105 tons/yr
VOC	1.79 tons/yr
CO	26.3 tons/yr

Four (4) 11.55 MMBtu per hour Emergency Generators

PM	0.165 tons/yr
PM10	0.272 tons/yr
SO_2	5.86 tons/yr
NOx	1.65 tons/yr
VOC	0.028 tons/yr
CO	0.413 tons/yr

Fuel Limits for NOx (using natural gas) and SO_2 (using No. 2 fuel oil).

NOx = 39 tons/yr (limit)
S 1.65 tons/yr (generators)
= 37.35 tons/yr limited NOx

SO_2 = 39 tons/yr (limit)
- 5.86 tons/yr (generators)
= 33.14 tons/yr limited SO_2

Potential fuel usage.

NOx = (168 MMBtu/hr)(8760 hr/yr)(1 MMCF/1000 MMBtu) = 1472 MMCF/yr

SO_2 = (168 MMBtu/hr)(8760 hr/yr)(1 kgal/1000 gal)(1 gal/0.140 MMBtu) = 10512 kgal/yr

Natural gas ("NOx") usage limit:

$$\frac{(37.35 \text{ tons/yr})}{(73.6 \text{ tons/yr})}(1472 \text{ MMCF/yr}) = 747 \text{ MMCF/yr}$$

No. 2 oil ("SO_2") usage limit:

$$\frac{(33.14 \text{ tons/yr})(10512 \text{ kgal/yr})}{(373 \text{ tons/yr})} = 934 \text{ kgal/yr}$$

Limited emissions of each fuel.

"NOx" Limit (Nat. gas limited firing)

PM	0.711 tons/yr
PM10	2.83 tons/yr
SO_2	0.224 tons/yr
NOx	37.35 tons/yr
VOC	2.06 tons/yr
CO	31.7 tons/yr

"SO_2" Limit (No. 2 oil limited firing)

PM	0.933 tons/yr
PM10	1.54 tons/yr
SO_2	33.14 tons/yr
NOx	9.33 tons/yr
VOC	0.159 tons/yr
CO	2.34 tons/yr

SO_2 = 33.14 tons/yr
- 0.224 tons/yr (limited combustion of Nat. gas)
32.916 tons/yr limited SO_2

No. 2 oil ("SO_2") revised usage limit:

$$= \frac{(32.916 \text{ tons/yr})(10512 \text{ kgal/yr})}{(373 \text{ tons/yr})}$$

= 927.6 kgal/yr (total for 4 boilers, 231 kgal/yr for each boiler)

NOx Limit (Nat. gas limited firing).

PM	0.711 tons/yr
PM10	2.83 tons/yr
SO_2	0.224 tons/yr
NOx	37.35 tons/yr
VOC	2.06 tons/yr
CO	31.3 tons/yr

SO_2 revised limit (No. 2 oil limited firing).

PM	0.926 tons/yr
PM10	1.53 tons/yr
SO_2	32.91 tons/yr
NOx	9.26 tons/yr
VOC	0.158 tons/yr
CO	2.32 tons/yr

Equivalence of No. 2 fuel oil to Natural gas.

Nat. gas:

$$= \frac{(73.6 \text{ tons/yr})(2000 \text{ lb/ton})}{(1472 \text{ MMCF/yr})}$$

$$= 100 \text{ lbs/MMCF}$$

No. 2 fuel oil:

$$= \frac{(105 \text{ tons/yr})(2000 \text{ lb/ton})}{(10512 \text{ MMCF/yr})}$$

$$= 20 \text{ lb/1000 gals}$$

Equivalence ratio:

$$= \frac{20 \text{ lb/1000 gals}}{100 \text{ lb/MMCF}} = \frac{0.20 \text{ MMCF}}{1000 \text{ gals}}$$

The input of No. 2 fuel oil to the 168 MMBtu per hour boilers (4 boilers at 42 MMBtu per hour each) shall be limited to 77,300 gallons per month (927.6 kgal/yr). This usage limit is equivalent to a potential to emit of 32.91 tons of sulfur dioxide per year.

The input of natural gas and natural gas equivalents to the 168 MMBtu per hour boilers shall be limited to 62.3 million cubic feet per month (747 MMCF/yr). For the purpose of determining compliance, every 1000 gallons of No. 2 fuel oil burned shall be equivalent to 0.20 million cubic feet of natural gas based on nitrogen oxides emissions. This usage limit is required to limit the potential to emit of nitrogen oxides to less than 37.35 tons per year.