

217/785-1705

CONSTRUCTION PERMIT -- REVISED
NSPS SOURCE

PERMITTEE

University of Illinois at Chicago
Attn: Heather Jackson
1129 South Hermitage (MC 645)
Chicago, Illinois 60612

Application No.: 97050128

I.D. No.: 031600CEV

Applicant's Designation:

Date Received: September 4, 2012

Subject: Boilers and Engines

Date Issued: March 21, 2014

Location: University of Illinois at Chicago (UIC) - East Campus, 1140 South Morgan Street, Chicago, Cook County, 60607

Permit is hereby granted to the above-designated Permittee to CONSTRUCT emission source(s) and/or air pollution control equipment consisting of three high temperature hot water generators (boilers - one 50 mmBtu/hour and two 75 mmBtu/hour) and two gas-fired engine generators (4,000 KW each), as described in the above-referenced application. This Permit is subject to standard conditions attached hereto and the following condition(s):

1. Introduction

- a. This permit authorizes construction of the following emission units:
 - i. Three high temperature hot water generators or boilers, two with a nominal capacity of 75 mmBtu/hour and one with a nominal capacity of 50 mmBtu/hour, in Building 654/654A (the affected boilers). The affected boilers primarily combust natural gas with capability to combust distillate fuel oil as a backup fuel.
 - ii. Two natural gas-fired engine generator systems in Building 654, including engines (Engines #3 and #4, nominal capacity 4,000 KW each), duct burners and heat recovery coils (the affected engines). The duct burners operate as afterburners to control emissions of volatile organic material (VOM) and carbon monoxide (CO) from the engines.
- b. This revised permit:
 - i. Revises the permitted usage of natural gas and the permitted emissions of the affected boilers, which will accommodate periods when the utilization of the affected engines is low.

- ii. Revises the permitted emissions of the affected engines to reflect the control of emissions provided by the afterburners and to address particulate and sulfur dioxide (SO₂) emissions.
 - iii. Provides for use of distillate fuel oil, rather than residual fuel oil, as backup fuel for the affected boilers to address interruptions in the supply of natural gas to the boilers.
 - c.
 - i. This permit was initially issued based on this project not constituting a major modification pursuant to the federal rules for Prevention of Significant Deterioration (PSD), 40 CFR 52.21, and state rules for Major Stationary Sources Construction and Modification (MSSCAM), 35 IAC Part 203. This was because the new affected boilers and engines replaced four existing boilers such that the net increases in emissions were not significant.
 - ii. This revised permit is also based on this project continuing to not constitute a major modification pursuant to PSD or MSSCAM. This is because permitted emissions of CO and VOM are lower than provided by the original permit and there are still net decreases in emissions of NO_x and PM₁₀. (See the revised netting exercise in Attachment A.) In addition, the increase in emissions of PM_{2.5} and greenhouse gases (GHG), which were not regulated pollutants at the time the initial permit was issued, are not significant. (See Attachment B.)

2. Applicability of NSPS to the Affected Boilers

The affected boilers are subject to a New Source Performance Standard (NSPS) for Small Industrial - Commercial - Institutional Steam Generating Units, 40 CFR 60 Subpart Dc and the General Provisions of the NSPS, 40 CFR 60 Subpart A. The Illinois EPA is administering NSPS in Illinois on behalf of the United States EPA under a delegation agreement.

3. Operational and Emission Limits for the Affected Boilers

- a. Each affected boiler shall be operated so as to qualify as a "gas fired boiler" as defined by 40 CFR 63.11237. That is, each boiler shall only burn gaseous fuels not combined with any solid fuels and burn liquid fuel only during periods of gas curtailment, gas supply interruption, startups, or periodic testing on liquid fuel. Periodic testing of each boiler with liquid fuel shall not exceed a combined total of 48 hours during any calendar year.
- b.
 - i. Upon the effective date of this revised permit, the affected boilers shall not fire residual fuel oil.
 - ii. Any oil fired in the affected boilers shall meet the specifications in 40 CFR 60.42c(d).

- c. Emissions and fuel usage of the affected boilers, combined, shall not exceed the following limits. These limits are based on information provided in the application including manufacturer and AP-42 emission factors and maximum throughputs.

Natural Gas Usage		Distillate Fuel Oil Usage	
(mmft ³ /Mo)	(mmft ³ /Yr)	(Gal/Mo)	(Gal/Yr)
130	800	150,000	600,000

Pollutant	Emission Limits			
	Natural Gas Combustion		Distillate Oil Combustion	
	(Tons/Mo)	(Tons/Yr)	(Tons/Mo)	(Tons/Yr)
NO _x	2.08	12.8	1.50	6.0
CO	5.46	33.6	0.38	1.5
PM/PM ₁₀	0.49	3.04	0.25	0.99
SO ₂	0.04	0.24	0.53	2.13
VOM	0.36	2.2	0.03	0.1

4. Operational and Emission Limits for the Affected Engines

- a. The affected engines shall fire only natural gas.
- b. Total combined emissions and operation of the affected engines shall not exceed the following limits. These limits are based on information provided in the application including manufacturer and AP-42 emission factors and maximum throughputs.

Natural Gas Usage	
(mmft ³ /Mo)	(mmft ³ /Yr)
55	649

Pollutant	Emission Limits	
	(Tons/Mo)	(Tons/Yr)
NO _x	7.9	92.8
CO	10.73	126.62
PM/PM ₁₀	0.28	3.31
SO ₂	0.02	0.19
VOM	0.28	3.25

5. NSPS Standards for the Affected Boilers

- a. i. The boilers shall not combust oil that contains greater than 0.5 weight percent sulfur pursuant to 40 CFR 60.42c(d).
- ii. Pursuant to 40 CFR 60.42c(h), compliance with this fuel oil sulfur limit may be determined based on a certification from the fuel supplier as provided by 40 CFR 60.48c(f). Pursuant to 40 CFR 60.42c(i), the fuel oil sulfur limit applies at all times, including periods of startup, shutdown or malfunction.

- b. The boilers shall not discharge gases into the atmosphere that exhibit greater than 20 percent opacity (6 minute average), except for one 6-minute period per hour of not more than 27 percent opacity pursuant to 40 CFR 60.43c(c). Pursuant to 40 CFR 60.43c(d), the opacity standard does not apply during periods of startup, shutdown or malfunction.

6. Operational Requirements for the Affected Engines

- a. The afterburner shall be in operation at all times that the engines are in operation and emitting.
- b. The afterburner capture and control system shall be operated in a manner consistent with good air pollution control practices.
- c. The Permittee shall, in accordance with the manufacturer(s) and/or vendor(s) recommendations, perform periodic maintenance on the pollution control equipment covered under this permit such that the pollution control equipment be kept in proper working condition.
- d. The combustion chamber of each afterburner shall be preheated to at least the temperature of the most recent stack testing for which the test results were used to determine emissions of the affected engines and at which compliance was demonstrated or, in the absence of a stack test that shows compliance, 1400°F. This temperature shall be maintained during operation on an hourly average basis. The Permittee may request a revision to this temperature based upon more recent stack testing results.

7. Opacity Monitoring for the Affected Boilers

- a. Pursuant to 40 CFR 60.47c, until distillate oil becomes the backup fuel for the affected boilers, the Permittee shall monitor, opacity during firing of oil by installing, calibrating, maintaining, and operating a Continuous Opacity Monitoring System (COMS) in accordance with 40 CFR 60.47c(a) and (b). The output of this system shall be recorded. This COMS shall be operated in accordance with the applicable procedures under Performance Specification 1 (40 CFR Appendix B) with the span value of the opacity COMS being between 60 and 80 percent.
- b. As also provided by 40 CFR 60.47c(c), when distillate oil (or other low-sulfur fuel) becomes the only backup fuel for the affected boilers, for firing of oil, the Permittee shall either conduct monitoring for opacity, as provided for in Condition 7(a), or conduct monitoring for opacity by one of the following alternatives:
 - i. Conduct performance tests for opacity by Method 9 in accordance with 40 CFR 60.47c(a) (initial testing) and 40 CFR 60.47c(a)(1), (a)(2) or (a)(3), as applicable (subsequent periodic testing).

- ii. Operate according to a written site-specific monitoring plan approved by the Illinois EPA that addresses operating parameters for the affected boilers that are indicative of compliance with the opacity standard, in accordance with 40 CFR 60.47c(f)(3), and comply with Condition 7(b)(i).

Note: These alternatives are available because any fuel oil burned in the boilers will have a sulfur content of no more than 0.5 percent by weight and post-combustion technology will not be used to reduce SO₂ or PM emissions of the boilers.

8. Operational Monitoring for Afterburners for the Affected Engines

Each afterburner shall be equipped with a continuous monitoring device which is installed, calibrated, maintained, and operated according to vendor specifications at all times that the afterburner is in use. This device shall monitor the afterburner combustion chamber temperature. Measured data shall be automatically recorded on hourly average basis.

9. Recordkeeping and Reporting for the Affected Boilers

For the affected boilers, the Permittee shall fulfill applicable notification and recordkeeping requirements of NSPS, including 40 CFR 60.7 and 60.48c.

10. General Recordkeeping and Reporting

- a. The Permittee shall keep records of the following items(s):
 - i. Total natural gas usage (mmft³/day, mmft³/month, and mmft³/year) of the affected boilers.
 - ii. Total fuel oil usage (gallons/month and gallons/year) of the affected boilers.
 - iii. Total natural gas usage (mmft³/month and mmft³/year) of each affected engine.
 - iv. Natural gas usage (mmft³/month and mmft³/year) by each afterburner.
 - v. A log of operating time for each engine, afterburner, and afterburner monitoring device.
 - vi. A maintenance log for each afterburner, and associated monitoring device detailing all routine and non-routine maintenance performed including dates and duration of any outages.
- b. All records and logs required by this permit shall be retained at a readily accessible location at the source for at least three years from the date of entry and shall be made available for inspection and copying by the Agency and USEPA upon request. Any

records retained in an electronic format (e.g., computer) shall be capable of being retrieved and printed on paper during normal source office hours so as to be able to respond to an Agency request for records during the course of a source inspection.

11. Deviations

If there is an exceedance of the requirements of this permit as determined by the records required by this permit, the Permittee shall submit a report to the Agency's Compliance Section in Springfield, Illinois within 30 days after the exceedance. The report shall include the emissions released in accordance with the recordkeeping requirements, a copy of the relevant records, and a description of the exceedance or violation and efforts to reduce emissions and future occurrences.

12. Compliance Procedures

- a. Compliance with annual limits set by this permit shall be determined from a running total of 12 months of data.
- b. Compliance with the emission limits for the affected boilers shall be determined based on the recordkeeping required by this permit and the following emission factors unless other credible emission factor(s) indicate higher emissions:

Pollutant	Emission Factor	
	Natural Gas (lbs/mmscf)	Distillate Oil (lbs/1000 gal)
NO _x	32 ^a	20
CO	84.0	5
PM/PM ₁₀	7.6	3.3
SO ₂	0.6	142S ^b
VOM	5.5	0.34

^a Emission factor for low NO_x burners/flue gas recirculation.

^b "S" indicates that the weight % of sulfur in the oil should be multiplied by the value given. For example, for fuel with 0.5% sulfur, "S" = 0.5.

- c. Compliance with the emission limits for the engines shall be determined based on the recordkeeping required by this permit and the following emission factors unless other credible emission factor(s) indicate higher emissions:

Pollutant	Emission Factor	
	g/HP-Hr	lbs/million scf
NO _x	1.0	--
CO	1.365 ^a	--
VOM	0.035 ^a	--
SO ₂	--	0.6
PM/PM ₁₀	--	10.2

- ^a The emission factors for CO and VOM reflect 30% and 95% reduction, respectively, from the uncontrolled emission factors provided by manufacturer, to account for the destruction efficiency of the afterburner.

13. Compliance Procedures for Boiler Opacity

Compliance with opacity limits shall be determined by performance testing in accordance with 40 CFR 60.45c(a) and/or by other applicable methods, as provided for by 40 CFR 60.47c.

14. Testing for Boilers and Engines

- a. Within 180 days of operation of the boilers, or within 60 days after achieving maximum firing rate, whichever occurs first, the Permittee shall conduct initial performance tests on the boilers. These tests consist of the following:
- i. Opacity testing in accordance with 40 CFR 60.45(c)(a)(7), i.e., USEPA Method 9.
 - ii. Sampling and analyzing the oil in the tanks from which the boilers will receive oil for firing.
 - iii. These performance tests shall be conducted under conditions which are representative of maximum emissions.
- b.
- i. Within 180 days of completion of construction of the engines with afterburner, the VOM in the effluent stream of an afterburner shall be measured by an approved testing service. These tests shall be conducted in accordance with 35 Ill. Adm. Code 218.105.
 - ii. The test shall be designed to measure both the destruction efficiency across the afterburner and to determine an emission factor for VOM for the engines.
 - iii. Prior to conducting such a test, the Illinois EPA should be consulted to verify that the intended test method is approved and is appropriate for use in testing this equipment.
 - iv. This test shall be conducted during circumstances which are representative of maximum emissions, and equipment data and material usage during the test shall be recorded.
 - v. Copies of the Final Report(s) for these tests shall be submitted to the Illinois EPA within 14 days after the test results are compiled and finalized.
 - vi. The Final Report shall include as a minimum:

- A. A summary of results, including an emission factor for the emissions of VOM in units of lbs VOM per mmft³ of natural gas burned.
- B. General information.
- C. Descriptions of test method(s), including description of sampling points, sampling train, analysis equipment, and test schedule.
- D. Detailed description of test conditions, including:
 - 1. Process information, i.e., mode(s) of operation, fuel or consumption, and
 - 2. Control equipment information, i.e., equipment condition and operating parameters during testing.
- E. Data and calculations, including copies of all raw data sheets and records of laboratory analyses, sample calculations, and data on equipment calibration.

Note: The issuance of this revised permit does not require that emission testing that accompanied the initial operation of the affected boilers and engines be repeated.

15. Authorization for Operation

Operation of the affected boilers and engines is allowed under this revised permit until a Clean Air Act Permit Program (CAAPP) permit is issued that addresses this revised construction permit.

Note: This revised permit does not include the conditions of the original permit that addressed the initial operation of the affected boilers and engines.

Please note that this permit is issued based on the affected boilers not being subject to standards or requirements pursuant to 40 CFR 63 Subpart JJJJJJ, commonly known as the Area Source Boiler NESHAP, as the boilers will be operated as to qualify as "gas fired boilers", pursuant to 40 CFR 63.11195.

For the affected engines, this permit does not address 40 CFR 63 Subpart ZZZZ, commonly known as the Engine NESHAP. For the engines, the Permittee must comply with the applicable requirements of this NESHAP, which will be addressed in future CAAPP permits for the source.

If you have any questions on this permit, please call Manish Patel or Christopher Romaine at 217/785-1705.

Raymond E. Pilapil
Acting Manager, Permit Section
Division of Air Pollution Control

Date Signed: _____

REP:MNP:psj

cc: FOS Region 1, Illinois EPA
CAAPP Permit File - 96080123, Illinois EPA
Lotus Notes

Attachment A

Table I

Potential Emissions of New Equipment
(Updated with the revised permit)

Emission Units	Emissions (Tons/Year)				
	CO	NO _x	PM/PM ₁₀	SO ₂	VOM
Boilers	35.10	18.80	4.03	2.37	2.30
Engines*	126.62	92.76	3.31	0.19	3.25
Total	161.72	111.56	7.34	2.56	5.55

* Emissions after considering afterburner control.

Table II

Historic Actual Emissions of Existing Equipment to be Removed

Emission Unit	Emissions (Tons/Year)				
	CO	NO _x	PM/PM ₁₀	SO ₂	VOM
4 Boilers*	71.5	160.5	9.95	2.2	4.45

* These emissions are an average of 1994 and 1995 reported emissions.

Table III

Change in Emissions
(Updated with the revised permit)

Time Period	Pollutant				
	CO	NO _x	PM/PM ₁₀	SO ₂	VOM
Future Potential	161.72	111.56	7.34	2.56	5.55
Emissions Decrease	71.5	160.5	9.95	2.2	4.45
Net Change	90.22	- 48.94	- 2.61	0.36	1.10

Note: This revised permit has implications for the evaluation of the net change in emissions for another, subsequent project by UIC that involved turbines and engines at the West Campus, which is addressed by Construction Permit 98100093. With this revised permit, the net changes in emissions of CO, NO_x, SO₂ and VOM will be lower than indicated in Permit 98100093. The net change in emissions of PM₁₀ is higher (i.e., a net increase of 10.25 tons/year in Permit 98100093, rather than 6.75 tons/year) but continues to be less than the significant emissions threshold for PM₁₀ of 15 tons/year.

Attachment B

Assessment of Changes in PM₁₀, PM_{2.5} and GHG Emissions from Permitted Increase
in Natural Gas Usage by the Affected Boilers (Tons/year)*

Time Period	PM ₁₀ /PM _{2.5}	GHG (as CO ₂ e)
Future	3.04	48,112
Baseline	1.00	15,816
Change:	2.04	32,296

* The past emissions of the boilers are based on the prior permitted usage of natural gas, which is less than the actual usage of natural gas in recent years. The future emissions are based on the new proposed limit on natural gas usage. This assessment does not consider decreases in emissions due to the change in the backup fuel oil for the boilers, as also provided for by this revised construction permit.

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