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21 August 2013

Mr. Raymond Pilapil
Illinois EPA
Bureau of Air, Compliance Section
P.O. Box 19276
Springfield, Illinois
62794-9276

Subject: **Performance Test Report**
I.D. 119090AAO
Shell Oil Products US

Dear Mr. Pilapil:

Shell Oil Products US (SOPUS) operates a soil vapor extraction system (SVE) at a corrective action site located in the Village of Roxana, in Madison County, Illinois. The SVE uses a blower to extract soil gas from the ground where it is passed through a knockout tank thatextracts condensate from the gas stream. The gas stream is conveyed to a natural gas fired RTO to destroy hydrocarbon constituents. On April 16, 2013, SOPUS received your letter dated April 12, 2013 requiring that SOPUS perform emissions testing to measure benzene and volatile organic material (VOM) emissions at the inlet and outlet of the regenerative thermal oxidizer (RTO) during operation of the soil vapor extraction system (SVE). Illinois Environmental Protection Agency (IEPA) required testing to establish the minimum acceptable temperature for the combustion chamber that will ensure compliance with the permitted emission limits, applicable emission standards prescribed by the Clean Air Act, and regulations promulgated thereunder.

SOPUS retained Geosyntec Consultants (Geosyntec) to oversee and manage the required emissions testing. Geosyntec is submitting the attached test report for the required testing on behalf of SOPUS. Emission testing was conducted June 25-26, 2013 following the test plan approved by IEPA on June 21, 2013. The emission testing was conducted to measure benzene and VOM emissions at the inlet and outlet of the RTO during operation of the SVE. The testing was conducted in accordance with United States Environmental Protection Agency (USEPA) Reference Methods. Testing was conducted at a range of combustion chamber temperatures (1500°F, 1550°F, and 1630°F).

If you have any questions regarding the enclosed test report, please feel free to contact Kate Graf at (267) 419-3103.

Sincerely,

Robert Ettinger
Principal

Kate Graf
Senior Consultant

Copies:

1. Kevin Mattison (hard copy and email copy)
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   Bureau of Air, Compliance Section (Third Floor)
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   Des Plaines, IL 60016
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   Kevin.Dyer@shell.com

Attachments: Performance Test Report

Prepared for:

Shell Oil Products US
17 Junction Drive
PMB#299
Glen Carbon, Illinois 62034

Regenerative Thermal Oxidizer Performance Testing Report

Roxana, Illinois

Prepared by:

Geosyntec consultants

engineers | scientists | innovators

924 Anacapa Street, Suite 4A
Santa Barbara, CA 93101

Project Number: SB0633

August 21, 2013

SV Regenerative Thermal Oxidizer Performance Testing Report

Roxana, Illinois

Prepared for:

Shell Oil Products US

Kate Graf
Senior Consultant

Greg Coleman
Senior Scientist

Robert Ettinger
Principal

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1.0 INTRODUCTION

Geosyntec Consultants (Geosyntec) has been retained by Shell Oil Products US (SOPUS) to arrange for and oversee stack testing required by the Illinois Environmental Protection Agency (IEPA). SOPUS operates a soil vapor extraction (SVE) system at a corrective action site located in the Village of Roxana, in Madison County, Illinois. The SVE system uses a blower to extract soil gas from the ground where it is passed through a knockout tank which extracts the condensate from the gas stream. The gas stream is then conveyed to a natural gas fired regenerative thermal oxidizer (RTO) to destroy hydrocarbon constituents prior to emissions. The RTO operates under an IEPA permit number 119090AAO issued on July 14, 2011.

In a letter dated April 12, 2013, the IEPA requested SOPUS conduct emission testing to measure benzene and volatile organic matter (VOM) emissions at the inlet and outlet of the RTO during operation of the SVE. This letter was received by SOPUS on April 16, 2013. Geosyntec submitted the test plan to IEPA on behalf of SOPUS on May 31, 2013 and received by the Agency on May 31, 2013. Based on additional testing considerations and discussions with IEPA, a revised test plan was submitted to IEPA on June 14, 2013 and received by the Agency on June 14, 2013. The test plan was reviewed by IEPA and approved June 21, 2013.

On June 20, 2013, IEPA requested that SOPUS perform a degradation study for benzene. IEPA required the degradation study because the EPA Method 18 samples were not extracted and analyzed by gas chromatograph (GC) directly. Rather than conduct on-site GC analysis, the samples were contained in Tedlar bag samples which were shipped to the laboratory for GC analysis. In lieu of conducting the degradation study, IEPA indicated that SOPUS could submit data from earlier third-party studies to demonstrate that benzene concentrations in Tedlar sample bags are not affected by delayed laboratory GC analysis. Because of the time constraints to complete the emission testing, SOPUS did not have sufficient time to obtain the appropriate data, submit the data to IEPA, and obtain approval that the data sufficiently demonstrated that the samples did not degrade. Thus, SOPUS agreed to conduct the benzene degradation study as part of this stack test program.

It is notable that EPA Method 18 allows for Tedlar bag sampling and laboratory GC analysis, provided that the average recovery factor meets the acceptability criteria (70 to 130% recovery). However, in addition to the recovery study required by EPA Method 18, IEPA also required that a degradation study be performed for benzene.

The April 12, 2013 letter requesting a performance test included a requirement that SOPUS conduct testing within 90 days of receipt of the IEPA letter. SOPUS received the letter April 16, 2013, resulting in a requirement to conduct the testing on or before July 15, 2013. In order to complete testing within the required 90 day window, SOPUS requested, in a letter dated May 31, 2013 and received by the IEPA on May 31, 2013, a waiver of the requirement for submittal of the test plan 45 days prior to the proposed test date. IEPA approved this request and approved the proposed test dates of June 24-27, 2013 via letter dated June 21, 2013.

Testing was conducted over two days, June 25 - 26, 2013. As requested by IEPA, testing was conducted at three combustion chamber temperature set points, based on minimum, normal, and maximum combustion chamber temperatures for the RTO since operation began.

In accordance with IEPA requirements, this test report is being submitted within 60 days of the test date.

2.0 TEST RESULTS SUMMARY

Emission testing was conducted to determine the hydrocarbon and benzene emission rates for three RTO set point temperatures. The IEPA requested that three emission tests be conducted at three different RTO temperatures, based on the range of temperatures since the RTO began operation. During normal operations, the RTO set point temperature is 1550°F. The test plan proposed testing at a range of RTO set point temperatures from 1500°F to 1650°F. The temperatures for testing were selected to allow operation above and below the normal set point temperature.

Each RTO emission test consisted of three runs. The tests were conducted at RTO set point temperatures of 1630°F[1], 1550°F, and 1500°F. A summary of the emission test results is provided in Table 1 below.

Table 1: Emission Testing Results Summary

Test	Set Point Temperature (°F)	Inlet Loading Rate (lb/hr)	Outlet Emission Rate (lb/hr)	Destruction Removal Efficiency
Test 1 – THC (average of 3 runs)	1630	87.6	0.613	99.3%
Test 1 – Benzene (average of 3 runs)	1630	1.27	<0.0267	>97.9%
Test 2 – THC (average of 3 runs)	1550	39.8	0.48	98.8%
Test 2 – Benzene (average of 3 runs)	1550	0.557	<0.0241	>95.7%
Test 3 – THC (average of 3 runs)	1500	60.6	0.714	98.8%
Test 3 – Benzene (average of 3 runs)	1500	1.09	0.0314	96.3%

Notes:

THC = Total Hydrocarbons, as carbon.

Emission rates noted as "<" had concentration measurements less than the analytical detection limit.

Destruction removal efficiency noted as ">" where emission rates were below the detection limit.

[1] A discussion of the lower maximum temperature set point that was proposed in the work plan is discussed below.

3.0 RTO DESCRIPTION AND OPERATION

The RTO is located on the southwestern boundary of the Phillips 66 Wood River Refinery North Property, near the corner of Chaffer Street and 8th Street in the Village of Roxana. Soil vapor from the SVE system is conveyed to the RTO for hydrocarbon constituent destruction. The RTO is an Anguil Environmental designed to treat 10,000 standard cubic feet per minute (SCFM). The RTO was designed for an inlet hydrocarbon emission rate of 75 to 100 lb/hr, and an outlet hydrocarbon emission rate of 2 to 5 lb/hr. The general arrangement drawing for the RTO is provided in the Attachment B.

The RTO normally operates at a set point of 1550°F. In order to evaluate the RTO operation over a range of temperatures, the RTO was operated at three set points during testing, 1630°F, 1550°F, and 1500°F.

During testing, the SVE system was operated with all wells on line and all well valves in the maximum open position. At the well manifold, all spare lines were closed to insure that no dilution air was added to the SVE effluent stream (the soil vapor).

The RTO system includes a manual inlet dilution air damper and two automated inlet air dampers. During normal operation, the combustion chamber set point temperature is 1550°F, and the manual inlet dilution air damper is set at 80% open, based on manufacturer recommendations. The automated inlet air dampers (shown in photos included in Attachment A) are designed to control the inlet air flow to maintain the RTO set point temperature. The automated dampers open to allow more dilution air into the RTO when the combustion chamber temperature exceeds the set point and close when the combustion chamber temperature is below the set point. During testing, the automated dampers operated normally, adjusting to operate the RTO at the three set point temperatures.

At the normal set point of 1550°F, the manual inlet dilution air damper was set at 80% open. During testing at 1500°F, the manual inlet dilution air damper was set at 100% open to maximize the dilution air and reduce the temperature of the inlet gas stream to the lower set point. For the high temperature testing at 1630°F, the manual inlet dilution air damper was set at 50% open. The automated inlet air dampers operated normally during the testing, adjusting to increase or decrease the amount of dilution air into the RTO in order to maintain the set point temperature.

The RTO was demonstrated to effectively control hydrocarbons and benzene across the range of temperatures tested, achieving total hydrocarbon (THC) destruction efficiencies of 99.3%, 98.8%, and 98.8%, respectively and benzene destruction efficiencies of >97.9%, >95.7%, and 96.3%, respectively.

4.0 PERFORMANCE TEST PROCEDURES

The emission testing was performed by Pace Analytical Field Services Division (Pace). Pace adheres to the ASTM D7036-04 Standard Practice for Competence of Air Emission Testing Bodies and has an interim accreditation with the Source Testing Accreditation Council. The full Pace Test Report is attached in Attachment B.

Matt McDermott, Jake Nelson, and Tom Rehling from Pace performed the on-site testing activities. Paul Robinson provided administrative project management for Pace. Greg Coleman of Geosyntec was on-site during the testing to coordinate testing with plant operations. George Jones of URS provided on-site assistance to adjust the RTO operation and conduct parametric monitoring during the testing. Kate Graf of Geosyntec served as the project manager and coordinated the test plan preparation, approval, and site testing with IEPA personnel. Grover Hopkins was the main IEPA point of contact for the test plan submittal review and approval. Jeff Benbenek served as the IEPA observer on site during the testing.

The emission testing included three tests; each test was comprised of three sampling runs. The duration of each sampling run was approximately 1 hour. The tests were conducted at RTO set point temperatures of 1630°F, 1550°F, and 1500°F. Testing was conducted at the inlet and outlet locations simultaneously. During testing, parametric monitoring was conducted to monitor the RTO combustion chamber temperature. Testing was conducted in accordance with the following USEPA Reference Methods or approved alternatives as noted below:

Parameter	Test Location	Test Method	Procedure
Traverse Points	Inlet	EPA Method 1[(1)]	Linear Measurements
Volumetric Airflow	Inlet	EPA Method 2	Pitot Tube
Gas Composition O_2 and CO_2	Inlet	EPA Method 3B[(2)]	Bag Samples/Orsat
Moisture Content	Inlet	EPA Method 4[(3)]	Impinger Condensate
Benzene	Inlet	EPA Method 18	Tedlar Bag and GC/MS
Total Hydrocarbons	Inlet	EPA Method 25A	Instrumental Analyzer - FID
Traverse Points	Outlet	EPA Method 1	Linear Measurements
Volumetric Airflow	Outlet	EPA Method 2	Pitot Tube
Gas Composition O_2 and CO_2	Outlet	EPA Method 3B[(2)]	Bag Samples/Orsat
Moisture Content	Outlet	EPA Method 4	Impinger Condensate
Benzene	Outlet	EPA Method 18	Tedlar Bag and GC/MS
Total Hydrocarbons	Outlet	EPA Method 25A	Instrumental Analyzer - FID

Notes:

(1) The inlet test location does not meet EPA Method 1 criteria because the RTO inlet duct is tapered at the proposed test port location. Prior to testing, a schematic of the proposed inlet sampling location was provided to IEPA for review. Grover Hopkins of IEPA approved the proposed sampling location and the port locations for volumetric airflow measurements and sampling.
(2) EPA Method 3A was proposed in the test plan, but in the field the testing firm proposed to utilize EPA Method 3B. Jeff Benbenek of IEPA approved the use of EPA Method 3B on site.
(3) EPA Method 4 was proposed in the test plan, but in the field the testing firm proposed to utilize Alternative EPA Method 4 (wet bulb/dry bulb) because of the high VOM and benzene concentrations at the inlet and the potential hazards associated with performing Method 4 at the inlet. Kevin Madison of IEPA approved the use of the Alternative EPA Method 4.

The inlet and outlet sampling locations were proposed in the test plan and approved by IEPA. The inlet sample ports are located in a section of rectangular ductwork that tapers and slopes vertically downward toward the inlet of the RTO. At the sample port location, the duct is 27 inches x 19.75 inches. A photograph of the inlet sample location is included in Attachment A. The EPA Method 1 field data sheet includes a sketch of the inlet sample port location and is included in the test report in Attachment B.

The outlet sample location is in a vertical section of the exhaust stack. The round duct is 32.5 inches in diameter. A photograph depicting the outlet sampling location is included in Attachment A. The EPA Method 1 field data sheet includes a sketch of the outlet sample location and is included in the test report in Attachment B.

The testing was conducted in accordance with the following test schedule:

Date and Time	RTO Set Point Temperature (°F)	Test / Run	Parameter	Location
6/25/13 15:25–16:25	1630	Test 1 / Run 1	Airflow; Gas Composition; Moisture Content; Benzene; THC	Inlet and Outlet
6/25/13 16:55–17:55	1630	Test 1 / Run 2	Airflow; Gas Composition; Moisture Content; Benzene; THC	Inlet and Outlet
6/25/13 18:25–19:25	1630	Test 1 / Run 3	Airflow; Gas Composition; Moisture Content; Benzene; THC	Inlet and Outlet
6/26/13 09:30-10:30	1550	Test 2 / Run 1	Airflow; Gas Composition; Moisture Content; Benzene; THC	Inlet and Outlet
6/26/13 11:00-12:00	1550	Test 2 / Run 2	Airflow; Gas Composition; Moisture Content; Benzene; THC	Inlet and Outlet
6/26/13 12:30-13:30	1550	Test 2 / Run 3	Airflow; Gas Composition; Moisture Content; Benzene; THC	Inlet and Outlet
6/26/13 15:00-16:00	1500	Test 3 / Run 1	Airflow; Gas Composition; Moisture Content; Benzene; THC	Inlet and Outlet
6/26/13 16:35-17:35	1500	Test 3 / Run 2	Airflow; Gas Composition; Moisture Content; Benzene; THC	Inlet and Outlet
6/26/13 18:10-19:10	1500	Test 3 / Run 3	Airflow; Gas Composition; Moisture Content; Benzene; THC	Inlet and Outlet

Prior to the start of each test, the RTO set point temperature was adjusted to the desired test set point temperature. The RTO's dampers adjusted to stabilize the unit operation at the test set point temperature. When the unit reached stable operation, testing commenced. The first test was run at the high set point temperature. The operations team attempted to run the RTO at a set point temperature of 1650°F, but the unit was not able to stabilize at that temperature, so the test was run at the maximum stable temperature of the unit (1630°F).

In accordance with IEPA requirements, flow measurements were taken twice during each test run. Wet-bulb/dry-bulb (to determine the moisture content of the gas stream) was also conducted twice during each test run.

5.0 TEST RESULTS

The IEPA requested SOPUS to perform testing to measure benzene and THC at the inlet and outlet of the RTO during operation of the SVE. The purpose of the testing was to establish a minimum acceptable operating temperature for the RTO to ensure compliance with permitted emission limits, applicable emission standards and regulations.

The RTO air permit does not include a destruction removal efficiency requirement, but in telephone conversations, Grover Hopkins of IEPA has indicated that IEPA typically requires control devices to achieve a destruction removal efficiency of at least 85%. Based on the testing results, the RTO has exceeded the required destruction removal efficiency for both THC and benzene. At the three RTO set point temperatures tested (1630°F, 1550°F, and 1500°F) the destruction removal efficiency for THC was greater than 99%. The destruction removal efficiency for benzene was greater than 96% for each of the three tests.

It is notable that the EPA Method 18 laboratory analysis determined the exhaust sample benzene concentrations for Runs 1, 2, and 3 of Test 1 and Runs 1, 2, and 3 of Test 2 to be less than the detection limit of 0.0276 parts per million by volume (ppm_v). The exhaust sample benzene concentrations from Runs 1 and 3 in Test 3 were between the minimum detection limit (MDL) and the limit of quantification (LOQ). The exhaust sample concentration of Run 2 of Test 3 was determined to be less than the detection limit of 0.311 ppm_v. For the Runs with analytical results below the detection limit, the destruction removal efficiency is calculated based on the highest potential benzene emission rate (i.e., detection limit) rather than the actual benzene emission rate. The actual benzene emission rate may be significantly less and the resulting destruction removal efficiency would be higher.

The emission test results and the applicable emission limits are in the tables below.

Test 1 Results: Set Point Temperature of 1630°F

	Emission Rate (lb/hr)	Monthly Emissions (tons/month) (1)	Annual Emissions (tons/yr) (2)
Benzene Emissions	<0.027	0.01	0.12
Benzene Emission Limit[2]	8.0	0.79	7.9
In Compliance?	Yes	Yes	Yes
THC Emissions	0.61	0.23	2.67
THC Emission Limit	8.0	2.4	24.9
In Compliance?	Yes	Yes	Yes

Test 2 Results: Set Point Temperature of 1550°F

	Emission Rate (lb/hr)	Monthly Emissions (tons/month) (1)	Annual Emissions (tons/yr) (2)
Benzene Emissions	<0.024	0.009	0.11
Benzene Emission Limit	8.0	0.79	7.9
In Compliance?	Yes	Yes	Yes
THC Emissions	0.48	0.18	2.10
THC Emission Limit	8.0	2.4	24.9
In Compliance?	Yes	Yes	Yes

Test 3 Results: Set Point Temperature of 1500°F

	Emission Rate (lb/hr)	Monthly Emissions (tons/month) (1)	Annual Emissions (tons/yr) (2)
Benzene Emissions	0.031	0.012	0.14
Benzene Emission Limit	8.0	0.79	7.9
In Compliance?	Yes	Yes	Yes
THC Emissions	0.71	0.022	3.11
THC Emission Limit	8.0	2.4	24.9
In Compliance?	Yes	Yes	Yes

Notes:

(1) The monthly emissions are calculated as potential monthly emissions, using the emission rate (in lb/hr) and an assumption of 744 hours of operation per month

[2] Benzene and THC emission limits from Joint Construction and Operating Permit 119090AAO issued July 14, 2011

(2) The annual emissions are calculated as potential annual emissions, using the emission rate (in lb/hr) and assuming 8760 hours of operation per year.

IEPA required that a benzene stability study be performed as part of this SV RTO performance test. To perform the study, tedlar sample bags were spiked with gaseous samples containing known concentrations of benzene. The gas used to spike the bags was chosen to be similar to the benzene concentrations in the emission testing samples. The spiked bag samples were held for at least as long as the emission testing sample were held prior to analysis. The results of the benzene stability study showed the benzene concentrations over the duration of the sample hold times were within analytical method quality control limits. The details of the test procedures and results of the benzene stability study are presented in Attachment C.

As noted in the tables above, each of the tests resulted in emissions that below emission limits contained in the joint construction and operation permit for the RTO. The destruction removal efficiency under all test conditions exceeded 99% for THC and 96% for benzene. These results clearly demonstrate that the RTO is compliant with permit requirements and effectively controls emissions of THC and benzene from the SVE operation at temperatures between 1500°F and 1630°F. The complete test data and analytical results are included in the Pace Test Report in Attachment B.

ATTACHMENT A

INLET AND OUTLET SAMPLING LOCATION PHOTOS

AUTOMATED INLET DAMPER PHOTO

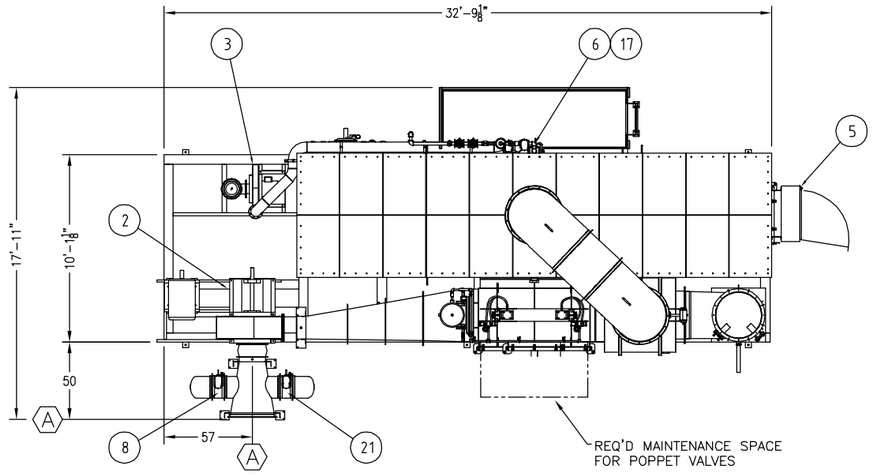
Inlet Sample Location

Outlet Sample Location

Automated Inlet Air Dampers

ATTACHMENT B

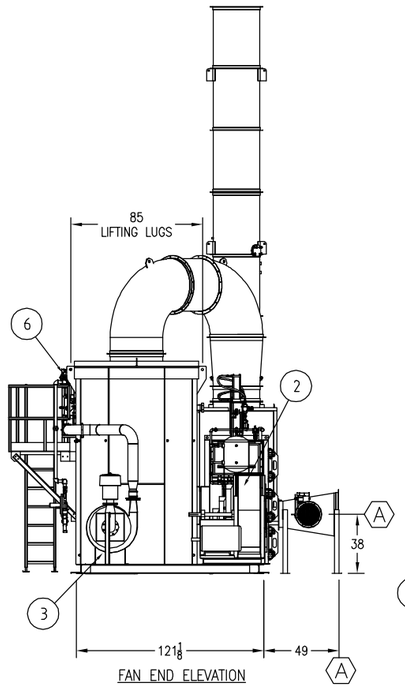
RTO GENERAL ARRANGEMENT DRAWING



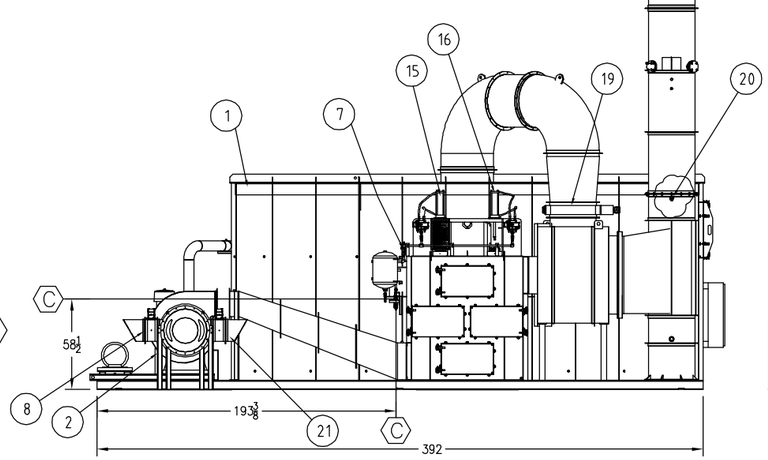
NOTES
1. PAINT COLOR SHALL BE ANGUIL STANDARD MEDIUM INDUSTRIAL GRAY.
2. AIR TO BE CLEAN AND DRY
3. ESTIMATED TOTAL WEIGHT: 65,000#
4. STACK TO BE PAINTED WITH HIGH TEMPERATURE ALUMINUM.
5. FAN, VALVES, DUCTWORK AND STACK INSULATED BY OTHERS.
6. INLET DUCTWORK SHALL BE DESIGNED FOR -10"WC PER SMACNA CLASS 2 STANDARDS.
   RECOMMENDED AIR VELOCITY IN MAIN HEADER 2500 FT/MIN.
7. INSULATION AND CLADDING OF DUCTWORK, FAN, POPPET VALVES AND STACK BY OTHERS IF REQUIRED.

REFERENCE DRAWINGS
15736-1 PROCESS & INSTRUMENTATION DRAWING
15736-400 ELECTRICAL SCHEMATICS
15736-6 FOUNDATION LAYOUT

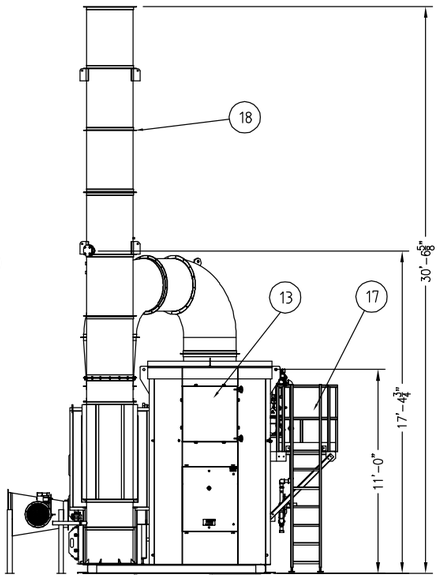
ITEM NO	DESCRIPTION	DWG. NO	TAG NO	COMMENTS
1	OXIDIZER ASSEMBLY	A000		
2	SYSTEM FAN	D000	F-101	
3	COMBUSTION FAN	F000	F-102	
4	FUEL TRAIN ASSEMBLY	H000		RIGHT TO LEFT FUEL FLOW
5	JUNCTION BOX	-451		
6	BURNER MAXON KINEMAX	H010		
7	COMPRESSED AIR TRAIN		V-606	
8	FRESH AIR INLET VALVE, ø14"	D000	TCV-400A	
9	THERMOCOUPLE 24" LONG		TE-127 A/B	
10	THERMOCOUPLE 24" LONG		TE-128 A/B	
11	THERMOCOUPLE 24" LONG		TE-121 A/B	
12	THERMOCOUPLE 24" LONG		TE-122 A/B	
13	UPPER CHAMBER ACCESS DOOR			
14	LOWER MEDIA SUPPORT ACCESS DOOR			
15	POPPET VALVE 28"ø		XV-109	
16	POPPET VALVE 28"ø		XV-110	
17	BURNER ACCESS PLATFORM			
18	EXHAUST STACK 30"ø X 30' TALL	E000		GUY WIRED
19	HOT GAS BYPASS VALVE 18"ID		TCV-135	REFRACTORY LINED
20	THERMOCOUPLE, STACK 24" LONG		TE-130 A/B	
21	FRESH AIR INLET VALVE, ø14"	D000	TCV-400B	



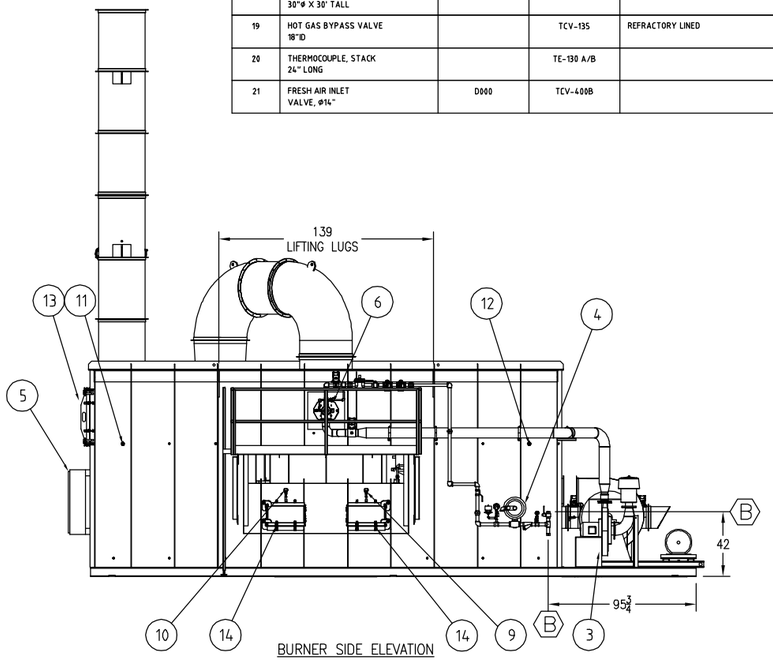
FAN END ELEVATION



POPPET SIDE ELEVATION



STACK END ELEVATION



BURNER SIDE ELEVATION

TERMINAL POINT SCHEDULE

TERMINAL POINT	DESCRIPTION	TERMINAL SIZE	CONNECTION TYPE
A	PROCESS AIR INLET	26"ø	FLANGE
B	FUEL INLET	1-1/2"	NPT
C	COMPRESSED AIR INLET	3/4"	NPT

REV	BY	DATE	CHANGE
B	CAG	26OCT11	REVISED GA PER AS BUILT UNIT
A	JPW	14OCT11	ADD 2ND FA DAMPER ITEM 20 & STACK TC ITEM 21

ANGUIL ENVIRONMENTAL SYSTEMS, INC.
MILWAUKEE, WISCONSIN

ANGUIL

TITLE
MODEL 100 REGENERATIVE THERMAL OXIDIZER
GENERAL ARRANGEMENT

DRAWING NO. 15736-7
SCALE 1/4"=1'-0"

DRAWN JPW DATE 28JULY11
CHECKED DATE
APPROVED DATE
LAST DRAWN JPW DATE 14OCT11

CUSTOMER
URS CORPORATION
ROXANA, IL

REV. B
SOURCE
PAGE 1 OF 1
LAST PLOT BY DATE

AUTOCAD PATH
M:\CAD\JOBS\15736

ATTACHMENT C

BENZENE STABILITY STUDY

Pace Analytical Services, Inc.
1700 Elm Street
Minneapolis, MN 55414
Phone: 612.607.1700
Fax: 612.607.6388
www.pacelabs.com

Pace Analytical®
Field Services Division

Benzene Stability Study

A stability study was performed at the request of the client. Blank bags were filled with air to approximately the same volume as the corresponding sample spike bag then spiked with benzene at levels as close as possible to the native inlet and outlet concentrations for each condition of sampling. The outlet bags were all ND or j-flagged so the stability bags were spiked at the same levels as the sample spike bags used for the recovery studies. The spiked bags were held for at least the same time period as the sample spike bags, and analyzed. The recovery values ranged from 75.1% to 93.5%.

Parameter	Stability Study Results	
Benzene Stability Study Results		
	Inlet LCS	***Outlet LCS***
Amount Spiked ppm	12.3	7.19
Benzene Conc ppm	11.5	6.32
% Recovery	93.5%	87.9%
Hold Time, hrs:min	20:31	23:28
	IN-MID-LCS	***OUT-MID-LCS***
Amount Spiked ppm	7.39	5.60
Benzene Conc ppm	5.55	4.57
% Recovery	75.1%	81.6%
Hold Time, hrs:min	35:26	37:42
	IN-LOW-LCS	***OUT-LOW-LCS***
Amount Spiked ppm	5.13	6.12
Benzene Conc ppm	4.23	5.10
% Recovery	82.4%	83.3%
Hold Time, hrs:min	33:07	34:04

ATTACHMENT D

PACE TEST REPORT